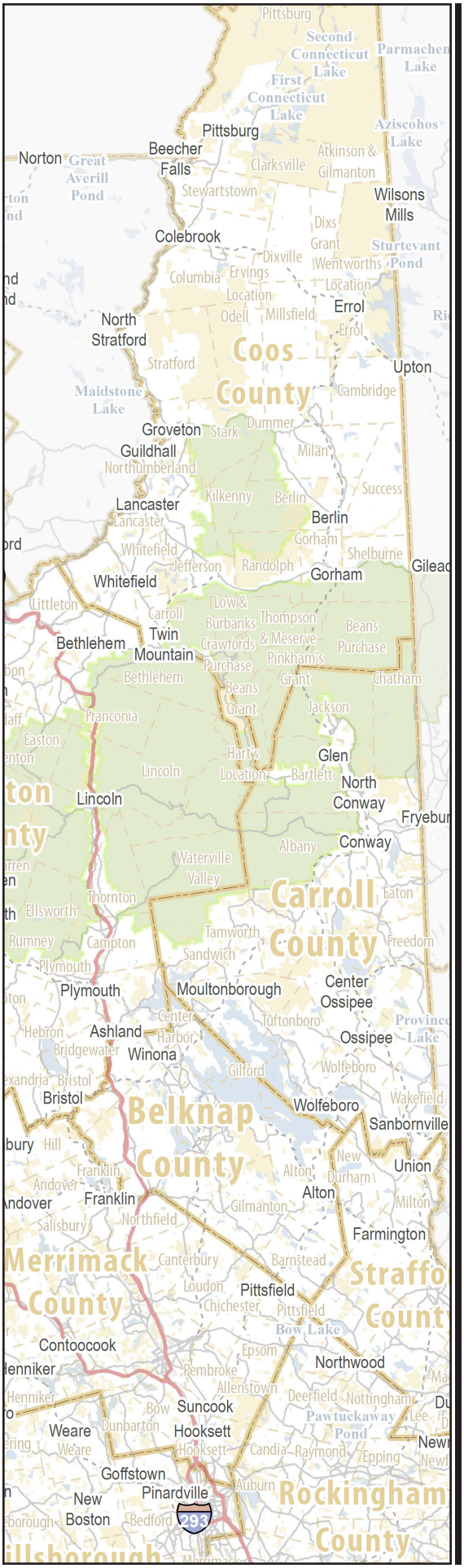


DOE/EIS-0463

DRAFT

NORTHERN PASS TRANSMISSION LINE PROJECT ENVIRONMENTAL IMPACT STATEMENT

SUMMARY

U.S. DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY
AND ENERGY RELIABILITY
WASHINGTON, DC

JULY 2015

Department of Energy
Washington, DC 20585
July 2015

Dear Sir/Madam:

Enclosed for your review and comment is the *Draft Northern Pass Transmission Line Project Environmental Impact Statement* (DOE/EIS-0463) prepared by the Department of Energy (DOE) pursuant to the National Environmental Policy Act of 1969 (NEPA) and its implementing regulations.

The U.S. Forest Service – White Mountain National Forest (USFS), the Army Corps of Engineers – New England District (USACE), the U.S. Environmental Protection Agency – Region 1 (EPA), and the New Hampshire Office of Energy and Planning (NHOEP) are cooperating agencies in the preparation of the EIS.

The proposed DOE action in the draft EIS is to issue a Presidential permit to the Applicant, Northern Pass LLC, to construct, operate, maintain, and connect a new electric transmission line across the U.S./Canada border in northern New Hampshire (NH).

DOE has prepared this draft EIS to evaluate the potential environmental impacts in the United States of the Proposed Action and the range of reasonable alternatives, including the No Action Alternative. Under the No Action Alternative, the Presidential permit would not be granted, and the proposed transmission line would not cross the U.S./Canada border.

DOE will use the EIS to ensure that it has the information it needs for informed decision-making.

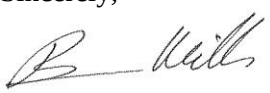
You are invited to comment on this draft EIS during the 90-day comment period that will begin when the U.S. Environmental Protection Agency publishes a notice of its availability in the *Federal Register*.

DOE will conduct public hearings on the dates identified below to receive comments on the draft EIS in the following locations: Tuesday, October 06, 2015 in Concord, NH; Wednesday, October 07, 2015 in Whitefield, NH; and Thursday, October 08, 2015 in Plymouth, NH.

Hearing information will be announced in the *Federal Register* and in local media, and will be posted on the project website, http://www.northernpasseis.us/**.** The draft EIS is available on this website and DOE's NEPA website at http://nepa.energy.gov/draft_environmental_impact_statements.htm.

Comments on the draft EIS can be submitted verbally during public hearings or in writing to Mr. Brian Mills at: Office of Electricity Delivery and Energy Reliability (OE-20), U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585; via e-mail to draftEIScomments@northernpasseis.us; or on the project website at http://www.northernpasseis.us/. Please mark envelopes and electronic mail subject lines as "Northern Pass Draft EIS Comments." Written comments must be received by October 29, 2015. Comments submitted after that date will be considered to the extent practicable.

Sincerely,



Brian Mills
National Electricity Delivery Division,
Office of Electricity Delivery and Energy Reliability
U.S. Department of Energy

DRAFT

NORTHERN PASS TRANSMISSION LINE PROJECT ENVIRONMENTAL IMPACT STATEMENT DOE/EIS-0463

Summary

U.S. DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY
AND ENERGY RELIABILITY

COOPERATING AGENCIES

United States Forest Service – White Mountain National Forest
United States Environmental Protection Agency– Region 1
United States Army Corps of Engineers – New England District
New Hampshire Office of Energy and Planning

July 2015

COVER SHEET

RESPONSIBLE FEDERAL AGENCY: U.S. Department of Energy (DOE), Office of Electricity Delivery and Energy Reliability

COOPERATING AGENCIES: United States Forest Service (USFS) – White Mountain National Forest (WMNF); United States Environmental Protection Agency (EPA) – Region 1; United States Army Corps of Engineers (USACE) – New England District; and New Hampshire Office of Energy and Planning (NHOEP)

TITLE: Northern Pass Transmission Line Project Environmental Impact Statement (DOE/EIS-0463)

LOCATION: Coös, Grafton, Belknap, Merrimack, and Rockingham counties in New Hampshire

CONTACTS: For additional information on this draft Environmental Impact Statement (EIS) contact:

Mr. Brian Mills, National Environmental Policy Act (NEPA) Document Manager
Office of Electricity Delivery and Energy Reliability, OE-20
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585
Telephone: (202) 586-8267
Brian.Mills@hq.doe.gov

For general information on the DOE NEPA process, please write or call:

Ms. Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance, GC-54 7U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585
askNEPA@hq.doe.gov
Telephone: (202) 586-4600 or leave a message at (800) 472-2756

ABSTRACT: Northern Pass Transmission, LLC (Northern Pass) has applied to the DOE for a Presidential permit to construct, operate, maintain, and connect a 187-mile (301-km) electric transmission line across the United States (U.S.)/Canada border in northern New Hampshire (NH). This draft EIS addresses the potential environmental impacts of the Project (Proposed Action), the No Action Alternative, and nine additional action alternatives (Alternatives 3 through 6, with variations). The NH portion of the Project would be a single circuit ±300 kilovolt (kV) high voltage direct current (HVDC) transmission line running approximately 153 miles (246 km) from the U.S. border crossing with Canada in Pittsburg, NH, to a new direct current-to-alternating current (DC-to-AC) converter station to be constructed in Franklin, NH. From Franklin, NH, to the Project terminus at the Public Service of New Hampshire's existing Deerfield Substation located in Deerfield, NH, the Project would consist of 34 miles (55 km) of 345 kV AC electric transmission line. The total length of the Project would be approximately 187 miles (301 km).

PUBLIC COMMENTS: In preparing this draft EIS, DOE considered comments received during the scoping period, which extended from February 11, 2011 to June 14, 2011, and was reopened from June 15, 2011 to November 5, 2013 (DOE accepted and considered all comments during the scoping period from February 11, 2011 to November 5, 2013). Additional comments were received during 11 public meetings that took place throughout the same time period in the following communities: Pembroke,

Franklin, Lincoln, Whitefield, Plymouth, Colebrook, Haverhill, and Concord, NH. Comments received during this period were considered during preparation of this draft EIS.

This draft EIS analyzes the potential environmental impacts of DOE issuing a Presidential permit for the proposed Northern Pass Project, which is DOE's proposed federal action. DOE will use the draft EIS to inform its decision on whether to issue a Presidential permit. Additionally, Northern Pass has applied to the USFS for a special use permit (SUP) authorizing Northern Pass to construct, operate, and maintain an electric power transmission line crossing portions of the WMNF. The WMNF Forest Supervisor will use the draft EIS to inform its decision regarding: 1) whether to issue a SUP under the Federal Land Policy and Management Act; 2) the selection of an alternative; 3) any need to amend the Forest Plan; and 4) what specific terms and conditions should apply if a SUP is issued.

Copies of the draft EIS are available for public review at 30 local libraries and town halls, or a copy can be requested from Mr. Brian Mills. The draft EIS is also available on the Northern Pass EIS website (http://www.northernpasseis.us/).

DOE invites comments on this draft EIS during the comment period that begins with the publication of the EPA's Notice of Availability in the *Federal Register*. In addition to comments on the draft EIS, DOE is seeking public input with respect to the cultural and historic property information presented in this draft EIS in accordance with its cultural and historic property review under Section 106 of the National Historic Preservation Act.

The EIS website (http://www.northernpasseis.us/) provides information on public hearings to be held at several locations in New Hampshire during the comment period. Comments on the draft EIS and Section 106 may be submitted on the EIS website (http://www.northernpasseis.us/), sent via email to draftEIScomments@northernpasseis.us or Section106comments@northernpasseis.us, sent to Mr. Brian Mills at the physical address above, or provided verbally or in writing at a public hearing. Written and oral comments will be given equal weight, and any comments received after the comment period ends will be considered to the extent practicable.

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SUMMARY

S.1 BACKGROUND

On October 14, 2010, Northern Pass Transmission, LLC[1] (Northern Pass or Applicant) applied to the Department of Energy (DOE) for a Presidential permit pursuant to Executive Order (EO) 10485, as amended by EO 12038, and the regulations codified at 10 Code of Federal Regulations (CFR) Part 205.320 *et seq*. (2000), "Application for Presidential Permit Authorizing the Construction, Connection, Operation, and Maintenance of Facilities for Transmission of Electric Energy at International Boundaries." The Presidential permit for the Applicant (OE Docket Number PP-362), if issued, would authorize Northern Pass to construct, operate, maintain, and connect facilities at the international border of the United States (U.S.) for the transmission of electric energy across the U.S./Canada border in northern New Hampshire (NH). DOE does not have siting or project alignment authority for projects proposed in applications for Presidential permits. On July 1, 2013, the Applicant submitted an amended application for a Presidential permit that reflected proposed changes to the route of the Project.

The DOE's Office of Electricity Delivery and Energy Reliability is responsible for reviewing Presidential permit applications and determining whether to grant a permit for electric transmission facilities that cross the U.S. international border. The DOE has determined that the issuance of a Presidential permit would constitute a major federal action and that an environmental impact statement (EIS) is the appropriate level of environmental review under the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C.] 4321 *et seq*.).

This draft EIS, *Northern Pass Transmission Line Project Environmental Impact Statement* (DOE/EIS-0463), analyzes potential environmental impacts from the Proposed Action (as described in the amended Presidential permit application filed by Northern Pass on July 1, 2013) and the range of reasonable alternatives (collectively referred to as "the Project"). The DOE has prepared this draft EIS in compliance with the requirements of NEPA, the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR Parts 1500–1508), DOE implementing procedures for NEPA (10 CFR Part 1021), DOE floodplain and wetlands environmental review requirements (10 CFR Part 1022), and other applicable federal laws. The DOE invited several federal and state agencies to participate in the preparation of this draft EIS as cooperating agencies because of their special expertise or jurisdiction by law. The cooperating agencies are the United States Forest Service (USFS) – White Mountain National Forest (WMNF), the United States Environmental Protection Agency (EPA) – Region 1, the United States Army Corps of Engineers (USACE) – New England District, and the New Hampshire Office of Energy and Planning (NHOEP).

On June 28, 2011, Northern Pass applied to the USFS requesting a special use permit (SUP) authorizing Northern Pass to construct, own, operate, and maintain an electric transmission line crossing portions of the WMNF. On September 5, 2013, Northern Pass submitted an amended SUP application to the USFS which also reflected proposed changes to the route of the Project. The USFS has siting authority for portions of the project crossing the WMNF.

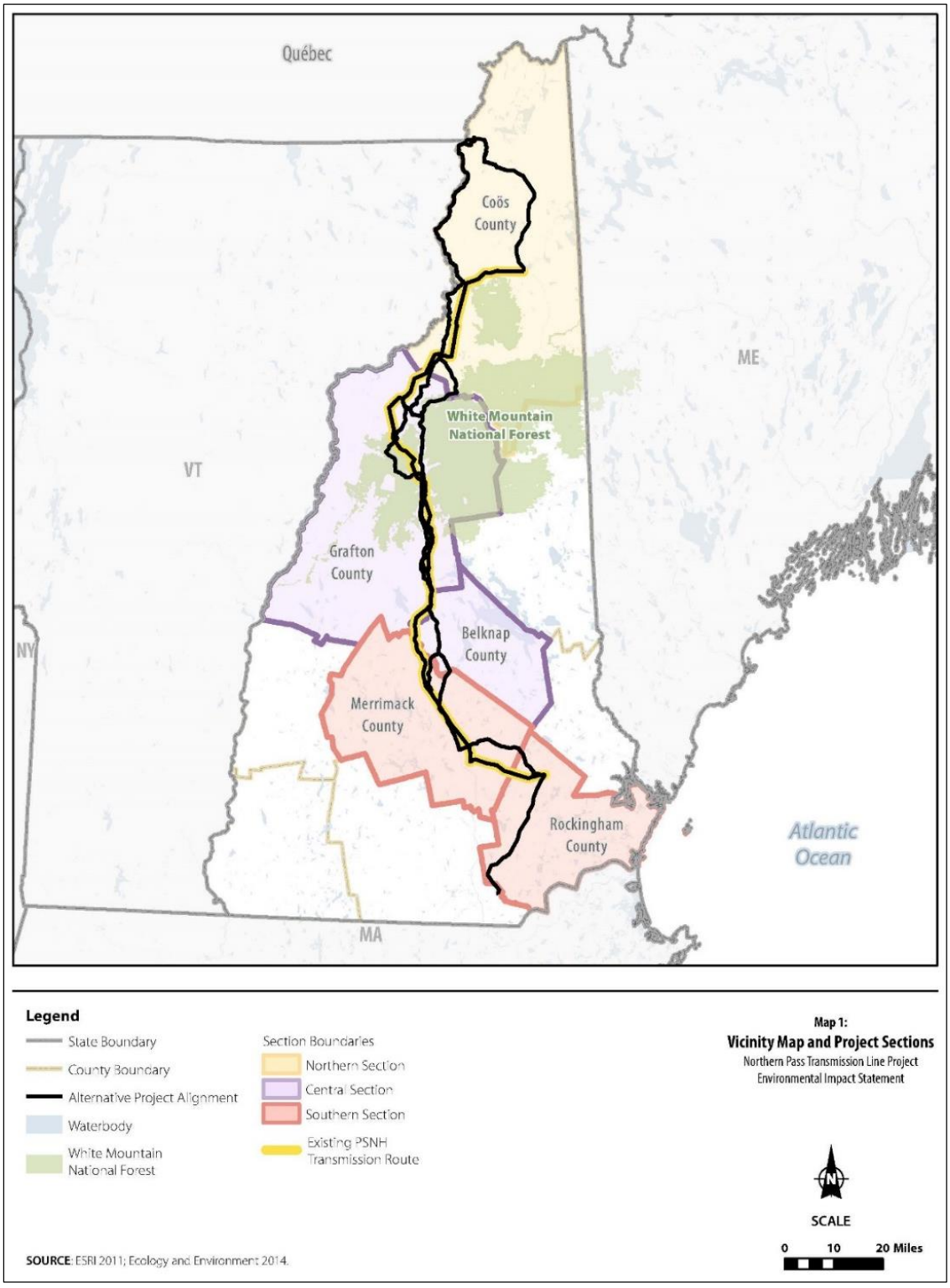
[1] Northern Pass Transmission, LLC is owned by Eversource Energy Transmission Ventures, Inc. (formerly NU Transmission Ventures, Inc.), a wholly-owned subsidiary of Eversource Energy (formerly Northeast Utilities), which is a publicly-held public utility holding company. Public Service of New Hampshire (PSNH) is also a wholly-owned subsidiary of Eversource Energy, and does business as Eversource Energy.

This draft EIS was prepared to meet the following key objectives:

- Identify baseline conditions within the study area (see **Section 3.1** for a definition of the study area for each resource)
- Identify and assess potential impacts on the natural and human environment that may result in the U.S. from issuing the Presidential permit and the SUP for the Project
- Describe and evaluate the range of reasonable alternatives to the Proposed Action in the U.S., including the No Action Alternative[2]
- Identify specific mitigation measures, as appropriate, to minimize potential environmental impacts
- Inform decision-making by the DOE, USFS, and other applicable federal and New Hampshire regulatory agencies responsible for the issuance of associated permits and approvals

[2] **Section S.5** summarizes all alternatives analyzed in the draft EIS.

Map 1, below (and in **Appendix A**), depicts the location of the Project.



Information regarding Northern Pass' Presidential permit application and the NEPA process is available on the DOE website for the EIS, found at http://www.northernpasseis.us/. Additional project information is available on the Applicant's website at http://northernpass.us/.

The information provided in this document is a summary of the draft EIS prepared by DOE. For each resource analyzed in the draft EIS, a detailed Technical Report was prepared by independent experts at the direction of DOE. The analysis in these Technical Reports is summarized in the draft EIS. The Technical Reports are available for review on the EIS website (http://www.northernpasseis.us/library/draft-eis/technical-reports).

S.2 PURPOSE OF AND NEED FOR ACTION

Northern Pass has applied to the DOE for a Presidential permit to construct, operate, maintain, and connect an approximately 187-mile (301-km), 1,200 megawatt (MW), high-voltage electric transmission line across the U.S./Canada border in New Hampshire. If granted, the Presidential permit would authorize the international border crossing. Applications for Presidential permits are evaluated based on the potential impacts that a proposed project could have on the environment, the operating reliability of the U.S. electric power supply, and any other factors relevant to the public interest. The purpose of, and need for, the DOE's action is to determine whether or not to grant the requested Presidential permit for the Project at the international border crossing proposed in the amended Presidential permit application.

Northern Pass has also applied to the USFS for a SUP authorizing Northern Pass to construct, operate, and maintain an electric power transmission line crossing portions of the WMNF. The purpose of, and need for, the USFS's action is to decide whether to grant a SUP for the Project. The USFS will consider the application for use of National Forest System (NFS) lands and determine if the Project is in the public interest and is appropriate, based on the WMNF Land and Resource Management Plan (Forest Plan) (USDA Forest Service 2005a). The Forest Supervisor will use the draft EIS to inform the decision regarding: 1) whether to issue a Special Use Authorization under the Federal Land Policy and Management Act; 2) the selection of a preferred alternative; 3) any need to amend the Forest Plan; and 4) what specific terms and conditions should apply if a SUP is issued.

S.3 PROJECT OBJECTIVES

Northern Pass set forth a detailed a range of project objectives and benefits in its permit applications to the DOE and USFS. The DOE and the cooperating agencies reviewed this documentation and determined the following general project objectives.

Purpose: The purpose of the Project is to build and operate a participant-funded electric transmission line to deliver 1,200 MW of low-carbon, non-intermittent power (approximately 98 percent hydropower) from Québec to southern New Hampshire to serve the New England region.

Needs: The Project would address three primary needs concerning New England's electricity supply:

- Diverse electricity supply
- Low-carbon electricity supply
- Non-intermittent electricity supply

Each of these needs is described in greater detail below.

Electricity Diversity

New England Independent Systems Operator (ISO-NE) reported in their 2014 Regional System Plan that "New England is increasingly dependent on natural gas as a primary fuel for generating electric energy…"

(ISO-NE 2014a). In 2013 natural gas plants provided approximately 45 percent of the system's electric energy production, as compared to approximately 15 percent in 2000 (ISO-NE 2013a and 2014a). The ISO-NE 2014 Regional System Plan anticipates further future reliance on natural gas due to the low price of natural gas and resulting retirement of less efficient oil and coal units, as well as the loss of nuclear generation capacity (ISO-NE 2014a). Approximately 3,300 MW of generation capacity (primarily coal and oil units) are scheduled for retirement over the next five years (ISO-NE 2014b). This heavy reliance on natural gas-fired capacity creates a risk to the New England electric system (ISO-NE 2014b).

Because New England does not have indigenous supplies of natural gas, it depends on natural gas importation. ISO-NE's 2013 Regional System Plan states that New England's increasing dependence on natural gas raises concerns regarding "the adequacy of the region's natural gas pipeline capacity and gas supply in the pipelines to serve electric power generation reliably" (ISO-NE 2013a). A 2013 report commissioned by the New England States Committee on Electricity similarly concludes that "in the absence of infrastructure or other solutions to increase supply or reduce demand, New England will experience significant natural gas infrastructure constraints" (Black & Veatch Corporation 2013a). Cold-weather conditions experienced in the 2013/14 winter season highlighted additional reliability concerns that existing natural gas infrastructure may not be able to meet the electric power system demand during peak winter conditions (Black & Veatch Corporation 2013a; ISO-NE 2014a).

According to a study commissioned by ISO-NE, "the region is projected to have shortfalls of natural gas supply during winter periods through 2020" (ISO-NE 2014a). Cold winter weather combined with natural gas pipeline constraints resulted in high natural gas prices and, consequently, high wholesale electricity prices in New England. According to ISO-NE's 2013 Annual Market Report, total wholesale electricity costs in 2013 were 45 percent higher than 2012 (resulting from higher natural gas prices) (ISO-NE 2014c). ISO-NE, regional stakeholders, and industry are taking actions to mitigate the regional risks due to its reliance on natural gas (ISO-NE 2013a).

The Federal Energy Regulatory Commission (FERC) has found that the Project would "diversify New England's power supply mix" (FERC 2011a).

Low Carbon Electricity Supply

In addition to diversifying the electricity supply, the utilization of low-carbon hydropower can help meet public policy goals to reduce greenhouse gas (GHG) emissions. In 2012 Hydro-Québec's generation capacity was 35,829 MW, 98 percent of which was hydroelectric power (NESCOE 2013a). Hydroelectric power is documented as a low-carbon energy source.[3]

Low-carbon hydropower can help achieve objectives and/or statutory requirements to reduce carbon emissions such as those presented in the New Hampshire Climate Action Plan, Regional Greenhouse Gas Initiative, the New England Governors' Regional Cooperation on Energy Infrastructure, and the President's

[3] In 2010 DOE National Renewable Energy Laboratory (NREL) conducted a Life Cycle Assessment (LCA) study to systematically review estimates of life cycle GHG emissions published between 1970 and 2010 from electricity generation technologies. The LCA considered emissions from all stages in the life cycle of an electricity generation technology, from component manufacturing, to operation of the generation facility to its decommissioning, and including acquisition, processing, and transport of any required fuels. The results of this study demonstrate that the greenhouse gas emissions from hydropower were equivalent to other sources of low-carbon power (wind and solar). Results can be found at http://www.nrel.gov/analysis/sustain_lca_hydro.html. Visit the following site to view comparative graphics displaying the lifetime GHG emissions from various energy sources: http://en.openei.org/apps/LCA/.

Climate Action Plan.[4] The New Hampshire Climate Action Plan includes a number of recommendations designed to "achieve a long-term reduction in greenhouse gas emissions of 80 percent below 1990 levels by 2050," including the importation of Canadian hydropower (NHDES 2009). In February 2013 the Regional Greenhouse Gas Initiative (RGGI) released revised GHG emissions standards for participating states that include a reduction of the 2014 regional carbon dioxide budget of 45 percent (RGGI 2013a).[5] The New England Governors' cooperative efforts include a commitment that in order to address the region's energy challenges, "together and respecting the bounds of individual state laws, we plan to continue to work to seek out economically beneficial infrastructure solutions to New England's power system challenges" (NESCOE 2015). In the President's Climate Action Plan, President Obama expressed a commitment to reducing GHG emissions in the range of 17 percent below 2005 levels by 2020, partly through the introduction of low-carbon electricity sources and retirement of carbon emitting electricity generators (Executive Office of the President 2013a). Additionally, the Hydropower Regulatory Efficiency Act of 2013 establishes an American interest in promoting the use of hydropower resources (Hydropower Regulatory Efficiency Act of 2013).

These national and regional policies are mirrored and enhanced in many individual New England state GHG emission mandates. Connecticut legislation mandates a reduction in GHG emissions of 80 percent below their 2001 level by January 2050, and Massachusetts has committed to a reduction of GHG emissions between 10 and 25 percent below 1990 levels by 2020 (Conn. Gen. Stat. § 22a-200a; Mass. Gen. Laws ch. 21N, § 4). Additionally, several New England state legislatures have recognized public benefits associated with reductions in GHG emissions and/or other air pollutants (N.H. Rev. Stat. Ann. § 362-F:1; N.H. Rev. Stat. Ann. § 125-O; Mass. Gen. Laws ch. 23J, § 9; R.I. Gen. Laws § 39-26-1).

Non-Intermittent Power Supply

Lastly, the Project has the potential to contribute a non-intermittent (i.e., baseload) power supply to the region. In its recent report titled "*Quantifying the Value of Hydropower in the Electric Grid: Final Report*" the Electric Power Research Institute (EPRI) noted that hydroelectric resources "contribute significantly to the reliability of the grid in terms of energy, capacity, and ancillary services" (EPRI 2013a). The EPRI report suggests that hydropower has the potential to address other generation and load variability, provide scheduling to optimize energy and ancillary services, provide fast regulation response, and, as noted above, add generation diversity. Currently, an aging nuclear fleet provides roughly 30 percent of ISO-NE's baseload generation (ISO-NE 2012a). As these sources retire, as demonstrated by the recent retirement of Vermont Yankee Nuclear Power Plant on December 29, 2014, there will be a need in the near-term for non-intermittent, reliable power in New England (U.S. NRC 2015a). A whitepaper published by the New England States Committee on Electricity also states that "it is no longer possible to safely assume that nuclear power will continue to provide the same approximate percentage of the region's base load power for the next decades in the face of low natural gas prices" (NESCOE 2013a). With a decline in reliable power from nuclear sources, and a need to diversify to avoid over-reliance on natural gas, hydroelectric power provides non-intermittent power needs (NESCOE 2013a).

[4] The New Hampshire Climate Action Plan can be found at: http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/nh_climate_action_plan.htm
The Regional Greenhouse Gas Initiative website is located at: http://www.rggi.org/
The New England Governors' Regional Cooperation on Energy Infrastructure can be found at: http://www.nescoe.com/uploads/6_State_Joint_Statement_FINAL_4-22-15_12-3.36pm_w-sealsf.pdf.
The President's Climate Action Plan can be found at: https://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf

[5] For Canadian hydropower to be eligible for credit under RGGI, the generation and transmission facilities would need to be outfitted with tracking and reporting systems to validate the clean energy attributes of the electricity.

S.4 PUBLIC PARTICIPATION AND INTERAGENCY COORDINATION

Public participation and interagency coordination are integral elements of the NEPA process and are intended to promote open communication between DOE and regulatory agencies, Native American tribes, potential stakeholder organizations, and the public. All individuals and organizations potentially affected by or interested in the Project are encouraged to participate in the public involvement process.

S.4.1 COOPERATING AGENCIES

The DOE invited several federal and state agencies to participate in the preparation of this draft EIS as cooperating agencies because of their special expertise or jurisdiction by law. The cooperating agencies are the USFS – WMNF, the EPA – Region 1, the USACE – New England Region, and the NHOEP.

S.4.2 PUBLIC INVOLVEMENT

S.4.2.1 Initial Public Scoping

The NEPA public scoping period began on February 11, 2011, following the DOE's publication of the Notice of Intent (NOI; 76 FR 7828). This and other relevant documents are available on the EIS website: http://www.northernpasseis.us. Through a notice in the *Federal Register* published on April 15, 2011 (76 FR 21338), DOE extended the scoping period to June 14, 2011.

During the initial public scoping period, seven public scoping meetings were held in March 2011 at several locations along the Project route (Pembroke, Franklin, Lincoln, Whitefield, Plymouth, Colebrook, and Haverhill, NH). The initial public scoping period closed on June 14, 2011.

S.4.2.2 Additional Public Scoping

On June 15, 2011, the DOE announced a reopening of the public scoping period, in anticipation of additional route information to be provided by Northern Pass, and stated that the scoping period would remain open until the DOE provided further notice of its closing (76 FR 34969). Following publication of the amended NOI (78 FR 54876; September 6, 2013), the public scoping period closed 60 days later on November 5, 2013.

Following the publication of the amended NOI, four additional public scoping meetings were held in September, 2013.

Through the public scoping process, commenters expressed concerns over a broad range of topics, including, but not limited to, the NEPA process, the federal agencies' purpose and need, the range of alternatives to be considered in the draft EIS, potential socioeconomic impacts in the region, potential visual impacts, potential impacts to wildlife, and potential impacts to tourism.

S.4.2.3 Draft EIS Public Review Period

The DOE is providing a public review period and will hold public hearings for this draft EIS. The public review period will be initiated through publication of a Notice of Availability (NOA) in the *Federal Register* by the EPA. DOE has notified the public and applicable federal and state agencies of the public review period for this draft EIS through several methods, including distribution of the document to individuals or parties who submitted scoping comments and to other interested parties that requested a copy of this draft EIS.

DOE has made this draft EIS available online at the Northern Pass EIS website (http://www.northernpasseis.us) and on the DOE NEPA website (http://energy.gov/nepa). This draft EIS

has also been circulated to federal, state, and local agencies with jurisdiction by law or special subject matter expertise and to any person, stakeholder organization, or agency that has requested a copy (40 CFR Part 1502.19). All comments on this draft EIS received or postmarked during the comment period will be considered in preparing the final EIS. Comments received after the end of the comment period will be considered to the extent practicable.

S.4.2.4 Public Participation in the Section 106 Process

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to consider the effects of a proposed undertaking that requires federal funding, approvals or permits on historic properties through consultation. The DOE is complying with Section 106 of the NHPA in coordination with its environmental review under NEPA. Through the public comment period for this draft EIS, DOE is seeking public input with respect to the cultural and historic property information presented in this draft EIS and on the Section 106 review for this undertaking. Section 106 comments may be submitted in written form to: Section106comments@northernpasseis.us. In addition, Section 106 comments can be submitted on the project website (http://www.northernpasseis.us/comment), and the commenter should check the box to indicate that the comments are relevant to the Section 106 process.

S.5 ALTERNATIVES ANALYZED

This draft EIS analyzes the No Action Alternative, the Proposed Action, and nine additional action alternatives (Alternatives 3–6 with variations). **Table S-1** describes each alternative analyzed, including a description of the converter stations and substations, and also provides the length of the transmission line (overhead, underground, and total) and the operational capacity. For a visual description of the alternatives, refer to Maps 5–15 in **Appendix A**.

Table S-1. Alternatives Considered in Detail

Alternative	Description	Length Overhead miles (km)	Length Underground miles (km)	Total Length miles (km)[a]	Operational Capacity (MW)
1	No Action	N/A	N/A	N/A	0
2	Proposed Action, primarily overhead in existing Public Service of New Hampshire (PSNH) transmission route, convert from HVDC to HVAC at Franklin Converter Station, overhead HVAC to Deerfield Substation	179 (288)	8 (13)	187 (301)	1,200
3	Underground in Proposed Action alignment, convert from HVDC to HVAC at alternate North Road Converter Station, underground HVAC to Deerfield Substation	0	187 (301)	187 (301)	1,000
4	Underground in roadway corridors				
4a	Underground in roadway corridors, I-93 through Franconia Notch, convert from HVDC to HVAC at alternate North Road Converter Station, underground HVAC to Deerfield Substation	0	175 (282)	175 (282)	1,000
4b	Underground in roadway corridors, NH Routes 112 and 116 through WMNF, convert from HVDC to HVAC at alternate North Road Converter Station, underground HVAC to Deerfield Substation	0	190 (306)	190 (306)	1,000

Table S-1. Alternatives Considered in Detail

Alternative	Description	Length Overhead miles (km)	Length Underground miles (km)	Total Length miles (km)[a]	Operational Capacity (MW)
4c	Underground in roadway corridors, NH Routes 112 and 116 through WMNF, US Route 3 from North Woodstock to Ashland, NH, convert from HVDC to HVAC at alternate North Road Converter Station, underground HVAC to Deerfield Substation	0	182 (293)	182 (293)	1,000
5	Proposed Action except underground in roadway corridors in the vicinity of the WMNF				
5a	Proposed Action except underground in I-93 corridor through Franconia Notch	156 (251)	28 (45)	184 (296)	1,000
5b	Proposed Action except underground in NH Routes 112 and 116 through WMNF	170 (274)	21 (34)	190 (306)	1,200
5c	Proposed Action except underground in NH Routes 18, 112 and 116 through Sugar Hill, Franconia, Easton, NH, and WMNF	157 (253)	33 (53)	191 (307)	1,000
6	Underground in roadway corridors until Franklin, NH and co-located HVAC between Franklin and Deerfield, NH				
6a	Underground in roadway corridors, I-93 through Franconia Notch, convert from HVDC to HVAC at Franklin Converter Station, co-located overhead HVAC to Deerfield Substation	34 (55)	139 (224)	173 (278)	1,000
6b	Underground in roadway corridors, NH Routes 112 and 116 through WMNF, convert from HVDC to HVAC at Franklin Converter Station, co-located overhead HVAC to Deerfield Substation	34 (55)	154 (248)	188 (303)	1,000

[a] Due to rounding, the total length of the Project may vary slightly from the sum of its parts.

S.5.1 ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Under the No Action Alternative, DOE would not issue a Presidential permit and the USFS would not issue a SUP for the Project, the proposed transmission system would not be constructed, and the potential impacts from the Project would not occur. The CEQ and DOE regulations require consideration of the No Action Alternative. The No Action Alternative serves as a baseline against which the potential environmental impacts of the Proposed Action and alternatives are evaluated.

S.5.2 ALTERNATIVE 2 – PROPOSED ACTION

DOE's Proposed Action is to issue a Presidential permit for the Project. Northern Pass, as the Applicant for the Presidential permit and SUP, would develop the Proposed Action as a transmission line to deliver electric power from Québec to southern New Hampshire.

The Proposed Action includes a proposed high-voltage direct current (HVDC) transmission line that, as currently designed, would be capable of transmitting up to 1,200 MW of power in either direction (Canada to the U.S. and U.S. to Canada). The northern HVDC converter station is proposed to be constructed at the Des Cantons Substation in Québec, Canada, and would be connected to an HVDC line that would run southward in Québec for approximately 45 miles (72 km) where it would cross the U.S./Canada border into Pittsburg, NH.

As proposed by Northern Pass, the Proposed Action would consist of a single circuit ±300 kilovolt (kV) HVDC transmission line running approximately 153 miles (246 km) from the U.S. border crossing with Canada in Pittsburg, NH, to a new direct current (DC)-to-alternating current (AC) converter station to be constructed in Franklin, NH. From Franklin, NH, to the Project terminus at the Public Service of New Hampshire's (PSNH's) existing Deerfield Substation located in Deerfield, NH, the Proposed Action would consist of 34 miles (55 km) of 345 kV AC electric transmission line. The total length of the Proposed Action would be approximately 187 miles (301 km).

As a part of the Project, system upgrades to existing PSNH AC transmission facilities would be required, including upgrades to the Deerfield Substation, Scobie Pond Substation (Londonderry, NH), and existing 345 kV transmission lines between the Deerfield Substation, Scobie Pond Substation, and Lawrence Road Substation (Hudson, NH). For additional description of these upgrades, see **Chapter 2**, **Section 2.3.2.5**. All action alternatives would include these upgrades.

S.5.3 ALTERNATIVE 3

Under Alternative 3, the Project would be constructed as an underground transmission cable for its entire length, and would be buried within the same alignment as the Proposed Action, except for a slight deviation to accommodate an alternate to the proposed converter station to be located at the intersection of the existing PSNH transmission route and North Road in Deerfield, NH (North Road Converter Station).

The Project under Alternative 3 would be approximately 187 miles (301 km) in length, requiring approximately 184 miles (296 km) of HVDC burial between the U.S./Canada border crossing and the North Road Converter Station, and approximately 3 miles (5 km) of HVAC burial to the Deerfield Substation. Due to the total length of the buried section(s) included under Alternative 3, the transmission system for this alternative would be developed with a capacity of 1,000 MW.[6]

S.5.4 ALTERNATIVE 4A

Under Alternative 4a, the Project would be constructed as an underground transmission cable for its entire length, and would be buried under or adjacent to existing roadways (state and federal) except for a portion of the line totaling just over 2 miles (3 km) from the U.S./Canada border crossing in Pittsburg, NH to US Route 3 in Clarksville, NH that would be buried in a new transmission route. Within the WMNF, Alternative 4a would be buried in the I-93 roadway corridor. Map 16 in **Appendix A** illustrates the differences between Alternatives 4a, 4b, and 4c in the vicinity of the WMNF.

The Project under Alternative 4a would be approximately 175 miles (282 km) in length, requiring the burial of approximately 172 miles (277 km) of HVDC transmission cable from the U.S./Canada border crossing to the North Road Converter Station and 3 miles (5 km) of HVAC transmission cable to the Deerfield Substation. Due to the total length of the buried section(s) included in Alternative 4a, the transmission system for this alternative would be developed with a capacity of 1,000 MW.[7]

S.5.5 ALTERNATIVE 4B

Under Alternative 4b, the Project would be constructed as an underground transmission cable for its entire length, and would be buried under or adjacent to existing roadways (state and federal) except for a portion of the line totaling just over 2 miles (3 km) from the U.S./Canada border crossing in Pittsburg, NH to US Route 3 in Clarksville, NH that would be buried in a new transmission route. Alternative 4b would follow the same alignment as Alternative 4a except for the portion in the vicinity of WMNF where it would follow

[6] DOE has determined that extended burial of a transmission line with a capacity of 1,000 MW would be practical and technically feasible. The burial of a transmission line with a capacity of 1,200 MW for extended distances would not be feasible. See **Section 2.1** for more information.

[7] See footnote 6

NH Routes 112 and 116. Map 16 in **Appendix A** illustrates the differences between Alternatives 4a, 4b, and 4c in the vicinity of the WMNF.

The Project under Alternative 4b would be approximately 190 miles (306 km) in length, requiring the burial of approximately 187 miles (301 km) of HVDC transmission cable from the U.S./Canada border crossing to the North Road Converter Station and 3 miles (5 km) of HVAC transmission cable to the Deerfield Substation. Due to the total length of the buried section(s) included in Alternative 4b, the transmission system for this alternative would be developed with a capacity of 1,000 MW.[8]

S.5.6 ALTERNATIVE 4C

Under Alternative 4c, the Project would be constructed as an underground transmission cable for its entire length, and would be buried under or adjacent to existing roadways (state and federal) except for a portion of the line totaling just over 2 miles (3 km) from the U.S./Canada border crossing in Pittsburg, NH to US Route 3 in Clarksville, NH that would be buried in a new transmission route. Alternative 4c would differ from Alternatives 4a and 4b between Whitefield and Franconia, NH, and North Woodstock and Ashland, NH where it would follow NH Routes 142, 112, and 116 and US Route 3. Map 16 in **Appendix A** illustrates the differences between Alternatives 4a, 4b, and 4c in the vicinity of the WMNF.

The Project under Alternative 4c would be approximately 182 miles (293 km) in length, requiring the burial of approximately 179 miles (288 km) of HVDC transmission cable from the U.S./Canada border crossing to the North Road Converter Station and 3 miles (5 km) of HVAC transmission cable to the Deerfield Substation. Due to the total length of the buried section(s) included in Alternative 4c, the transmission system for this alternative would be developed with a capacity of 1,000 MW.[9]

S.5.7 ALTERNATIVE 5A

Under Alternative 5a, the Project would be identical to the Proposed Action for the entire length of the transmission line except for the portion in the vicinity of the WMNF where the Project would be buried for an additional 20 miles (32 km) in the I-93 corridor. Map 17 in **Appendix A** illustrates the differences between Alternatives 5a, 5b, and 5c in the vicinity of the WMNF.

The Project under Alternative 5a would be approximately 184 miles (296 km) in length, with approximately 28 miles (45 km) of HVDC burial. Due to the total length of the buried section(s) included under Alternative 5a, the transmission system for this alternative would be developed with a capacity of 1,000 MW.[10]

S.5.8 ALTERNATIVE 5B

Under Alternative 5b, the Project would be identical to the Proposed Action for the entire length of the route except for the portion in the vicinity of the WMNF where the Project would be buried for an additional 13 miles (21 km) in the NH Route 116 and 112 corridors. Map 17 in **Appendix A** illustrates the differences between Alternatives 5a, 5b, and 5c in the vicinity of the WMNF.

The Project under Alternative 5b would be approximately 190 miles (306 km) in length, with approximately 21 miles (34 km) of underground HVDC transmission cable. The Project under Alternative 5b would be designed using technology capable of delivering 1,200 MW of power to Deerfield, NH.[11]

[8] See footnote 6
[9] See footnote 6
[10] See footnote 6
[11] The Applicant has indicated that buried segments of less than 24 miles (39 km) at a capacity of 1,200 MW would be economically reasonable.

S.5.9 ALTERNATIVE 5C

Under Alternative 5c, the Project would be identical to the Proposed Action for the entire length of the route except for the portion in the vicinity of WMNF where an additional 25 miles (40 km) of the Project would be buried in the NH Route 18, 112, and 116 corridors. Alternative 5c is identical to Alternative 5b except that it includes an additional portion of underground transmission cable through Sugar Hill, Franconia, and Easton, NH, and rejoins the existing PSNH transmission route at a different location in North Woodstock, NH. Map 17 in **Appendix A** illustrates the differences between Alternatives 5a, 5b, and 5c in the vicinity of the WMNF.

The Project under Alternative 5c would be approximately 191 miles (307 km) in length, with approximately 33 miles (53 km) of underground HVDC cable. Due to the total length of the buried section(s) included under Alternative 5c, the transmission system for this alternative would be developed with a capacity of 1,000 MW.[12]

S.5.10 ALTERNATIVE 6A

Under Alternative 6a, the HVDC transmission cable would be buried under or adjacent to existing roadways for approximately 139 miles (224 km) between the U.S./Canada border crossing and the proposed Franklin Converter Station. For approximately 34 miles (55 km) from the Franklin Converter Station to the destination substation in Deerfield, NH, the Project would be constructed as an overhead HVAC transmission line along the Proposed Action alignment, co-located with the existing PSNH AC lines on a new set of towers. Map 16 in **Appendix A** illustrates the differences between Alternatives 6a and 6b in the vicinity of the WMNF.

The Project under Alternative 6a would be approximately 173 miles (278 km) in length. Due to the total length of the buried section included under Alternative 6a, the transmission system for this alternative would be developed with a capacity of 1,000 MW.[13]

S.5.11 ALTERNATIVE 6B

Under Alternative 6b, the HVDC transmission cable would be buried under or adjacent to existing roadways for approximately 154 miles (248 km) between the U.S./Canada border crossing and the proposed Franklin Converter Station. For approximately 34 miles (55 km) from Franklin, NH to the destination substation in Deerfield, NH, the Project would be constructed as overhead HVAC transmission line along the Proposed Action alignment, co-located with the existing PSNH AC lines on a new set of towers. Alternative 6b would follow the same alignment as Alternative 6a except for the portion in the vicinity of WMNF where it would follow NH Routes 112 and 116. Map 16 in **Appendix A** illustrates the differences between Alternatives 6a and 6b in the vicinity of the WMNF.

The Project under Alternative 6b would be approximately 188 miles (303 km) in length. Due to the total length of the buried section included under Alternative 6b, the Project would use technology capable of delivering 1,000 MW of power to Deerfield, NH.[14]

[12] DOE has determined that extended burial of a transmission line with a capacity of 1,000 MW would be practical and technically feasible. The burial of a transmission line with a capacity of 1,200 MW for extended distances would not be feasible. See **Section 2.1** for more information.

[13] See footnote 12

[14] See footnote 12

S.6 ANALYSIS FRAMEWORK

S.6.1 DESCRIPTION OF GEOGRAPHIC ANALYSIS SECTIONS

For the purposes of understanding the various environmental settings associated with the Project, and to facilitate the analysis in this draft EIS, the analysis of the Project was divided into three geographic sections and one administrative section defined by the WMNF (Maps 1–4 in **Appendix A**):

- Northern Section
- Central Section
- Southern Section
- WMNF Section

The Northern Section includes portions of the Project within Coös County, NH. The Central Section includes portions of the Project within Grafton and Belknap counties, NH. The Southern Section includes portions of the Project within Merrimack and Rockingham counties, NH. The WMNF Section is within the Northern and Central Sections and includes portions of the Project within the borders of the WMNF.

S.6.2 CONSTRUCTION SCHEDULE

This analysis assumes an operational in-service date of 2019, if DOE issues a Presidential permit for the Project. DOE selected this date for purposes of the EIS analysis, and the date is entirely independent of any other in-service dates or projections which may have been stated or published by the Applicant.

S.6.3 OPERATIONS AND MAINTENANCE

For the portions of the route where transmission lines presently exist, operation, maintenance, and repair would not change substantially from what currently occurs. Along the entire route, Northern Pass and PSNH would perform maintenance of the existing lines, maintenance of rebuilt lines, and implementation of the Project in accordance with Eversource Energy's system maintenance policies and procedures. Specific requirements for high voltage transmission lines include periodic patrols of infrastructure and vegetation management (including vegetation maintenance every three years within cleared areas, and side trimming and tree removal every ten years, or as required).

Maintenance activities in the transmission route, depending on the natural features and accessibility of the transmission route, would be carried out on foot, by line truck, by track mounted vehicle, by all-terrain vehicle, or by snowmobile. All vegetation management and line maintenance activities associated with the Project's new lines or cables would be performed in accordance with the New Hampshire Division of Forest and Lands Best Management Practice for Utility Maintenance (NHDRED 2010a) and the Forest Plan. This Best Management Practice (BMP) publication provides guidance on several issues, including identifying appropriate means and methods for vegetation management and maintenance in or within the vicinity of jurisdictional wetlands. Northern Pass would be required to provide a field manual summarizing the BMPs to all contractors performing maintenance work in the transmission route.

Maintenance associated with transition stations (where the Project would transition from aboveground to underground transmission), the HVDC converter station (Franklin Converter Station or alternate North Road Converter Station), the underground cables, and the Deerfield and Scobie Pond Substation upgrades (see **Section S.5.2**) would also be performed in accordance with Eversource Energy's system maintenance policies and procedures.

S.7 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER DETAILED ANALYSIS

Several technology, alignment, and construction alternatives were suggested during the public scoping period. For various reasons, some of these alternatives were considered but eliminated from further detailed study. For additional detail regarding these alternatives, including reasons for elimination, see **Chapter 2, Section 2.4**.

The alternatives considered but eliminated include the following:

- Underground Transmission Cable with 1,200 MW Capacity
- Underground Transmission Cable in Railroad and Connecting Roadway Corridors
- Use the National Grid Phase I/II Route
- Underwater Transmission Cable in Navigable Waterways
- Overhead in Railroad and Connecting Roadway Corridors
- Multiple Aboveground, Belowground Options in Proposed Action Alignment
- Other Transmission Projects
- Power Generation Alternatives
- Energy Conservation
- Proposed Action except Underground Transmission Cable through Connecticut Headwaters
- Transmission Line in an Aboveground Pipeline within Proposed Action Alignment
- Bury Existing Line, Install New Line as Proposed
- Co-locate the Project (HVDC and HVAC) with the Existing Transmission Line on the Same Set of New Towers
- Relocate Proposed Project Terminus Substation
- Overhead Alternatives Convert to HVAC at the North Road Converter Station Location
- Underground HVAC from the Franklin Converter Station to the Deerfield Substation

S.8 MAJOR CONCLUSIONS

This section is intended to provide a general description of the main differences in potential environmental impacts among the action alternatives which were analyzed in detail. For comparison purposes, impacts in this section are considered within four groupings:

- Alternative 2 – Proposed Action
- Overhead with burial in the vicinity of the WMNF (Alternatives 5a, 5b, 5c)
- Fully/extensively underground (buried in the transmission route or buried along existing roads: Alternatives 3, 4a, 4b, 4c, 6a, 6b)
- Alternative 1 – No Action Alternative

Under all action alternatives: (1) no population-level effects to any protected species would be anticipated, (2) no disproportionately high and adverse human health or environmental impacts to minority or low-income communities would be expected, (3) no risks associated with EMFs would be expected, and (4) air emissions as a result of construction would not exceed *de minimis* thresholds.

Overall, Alternative 2 would impose the greatest environmental impacts as compared to the other action alternatives primarily because of visual impacts, vegetation removal and ground disturbance required for

the creation of a new 40-mile (64 km) long, 150-foot (64 m) wide route in the Northern Section of the Project. Alternative 2 would also have the least cost of construction (approximately $1.06 billion). While the least cost construction alternative is favorable to the Applicant, as compared to the other action alternatives, it is the least advantageous to local taxing jurisdictions because tax revenues would be based on the value of the construction/infrastructure costs.

The alternatives that would be constructed underground along existing roadways (Alternatives 4a, 4b, 4c, 6a, and 6b) would impose the fewest environmental impacts due to the lack of visual impacts and use of already disturbed roadway corridors. However, all of the underground alternatives (including Alternative 3) would have the highest construction costs (between approximately $1.83 billion [Alternative 6a] and approximately $2.11 billion [Alternative 4b]). Because of the higher construction cost, the underground alternatives would be disadvantageous to the Applicant but provide additional tax revenue to local taxing jurisdictions as compared to Alternative 2.

The alternatives that would be constructed overhead along most of the route and constructed underground in the vicinity of the WMNF (Alternatives 5a, 5b, and 5c) would avoid visual impacts to the WMNF in general, and the Appalachian National Scenic Trail (ANST) in particular. These alternatives would require the same vegetation removal and ground disturbance in the Northern Section as under Alternative 2, resulting in the same types of adverse environmental impacts in that area. Construction costs would higher than Alternative 2, ranging from approximately $1.15 billion to approximately $1.20 billion, but not as high as the fully underground alternatives.

Alternative 2, and the alternatives that would be constructed overhead along most of the route and constructed underground in the vicinity of the WMNF, would result in fewer short-term and permanent jobs as compared to the fully/extensively underground alternatives. The overhead alternatives would be expected to create between 5,000 and 6,000 short-term jobs (over a three-year period) and approximately 900 permanent jobs, while the underground alternatives would be expected to create between 9,000 and 10,000 short-term jobs (over a three-year period) and between 1,300 and 1,500 permanent jobs.

Alternative 2, and Alternative 5b, would be constructed with a 1,200 MW delivery capacity. As a result, these two alternatives would produce the greatest decrease in wholesale electricity costs in New Hampshire ($22 million reduction) and in the ISO-NE region ($149 million reduction). Additionally, these two alternatives would also be expected to reduce CO_2 emissions by 8 percent across the region.

Comparatively, alternatives with a delivery capacity of 1,000 MW (Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a and 6b) would result in a decrease in wholesale electricity costs of $18 million within New Hampshire, and $134 million within ISO-NE. These alternatives would be expected to reduce CO_2 emissions by 7 percent annually across the region.

S.8.1 ALTERNATIVE 2 – PROPOSED ACTION

The primary impact of Alternative 2 would be to visual resources. This could result in adverse impacts to tourism and recreation in the affected areas. This is the only alternative that would be inconsistent with existing WMNF Forest Plan standards due to potential visual impacts. The overhead transmission line could also be visible from historic architectural resources and thus could adversely affect the historic context of these sites more than the underground alternatives.

Alternative 2 would also result in the greatest impacts to vegetated habitats as compared to the other action alternatives because of the need to clear approximately 40 miles (64 km) of new corridor in the Northern Section and additional width in the existing corridor within the Central and Southern Sections. This land disturbance would also increase the potential for impacts to archeological resources and wildlife, including protected species.

This alternative would result in the lowest construction cost and correspondingly the lowest economic impacts as compared to the other action alternatives. Because construction costs would be lower, as compared to the other action alternatives, the revenue collected by local taxing jurisdictions along the transmission route would also be lower. In addition, visual impacts may reduce some residential property values along the proposed transmission route, which could also result in lower residential property tax revenue collections as compared to the underground alternatives. Decreases in residential property values would be expected to be greatest under Alternative 2, as compared to other action alternatives.

Alternative 2 would have an increased risk for operational hazards such as damage from extreme weather or intentional destructive acts, but would present a lower risk of exposing contaminated soils or groundwater during construction, as compared to the underground alternatives. Impacts to traffic and transportation would be less under Alternative 2 than for the alternatives located underground in roadway corridors.

Alternative 2 would also result in the greatest long-term wetlands impacts as compared to the other action alternatives, with up to 56 acres (23 ha) of wetlands affected including wetland type conversion which could change the function and uses of the wetlands.

Construction of Alternative 2 would result in fewer impacts to soils and have less potential for erosion as compared to the underground alternatives.

S.8.2 OVERHEAD WITH BURIAL IN THE VICINITY OF THE WMNF (ALTERNATIVES 5A, 5B, AND 5C)

The differentiator among these alternatives is the road routes along which the transmission line would be buried within, and in the vicinity of, the WMNF. For the most part, these differences do not result in appreciably different impacts among these alternatives. Any important differences in impacts are noted.

The primary impact of these alternatives would be to visual resources outside of the WMNF vicinity, which would be similar to Alternative 2. Because the transmission line would be buried within, and in the vicinity of, the WMNF, there would be no visual impacts to the ANST and these alternatives would be consistent with the WMNF Forest Plan. Further, impacts to tourism and recreation, to the extent they could occur, would be less under these alternatives than under Alternative 2 but greater than the underground alternatives.

These alternatives would cost between $1.15 billion and $1.20 billion to construct, which is slightly higher than Alternative 2 but lower than the fully/extensively underground alternatives. Thus, the economic impacts of the Project and impacts to local tax revenues would fall between the fully/extensively underground alternatives and Alternative 2. Potential impacts to residential property values would be slightly less than under Alternative 2, but greater than the fully/extensively underground alternatives.

Some blasting maybe required for the underground portions of the route. As a result, noise impacts may be greater under these alternatives than under Alternative 2, but less than noise impacts for the fully/extensively underground alternatives. The burial of a portion of the line would also result in a slightly greater potential for impacts to traffic and transportation and to soils and potential for erosion than Alternative 2, but less than for the fully/extensively underground alternatives.

Other impacts of these alternatives would be similar to or slightly less than those for Alternative 2 because the majority of the transmission line would be located overhead. This includes impacts to vegetation, wildlife, and soils. Alternatives 5a, 5b, and 5c would have a long-term impact on up to 55 acres (21 ha) of wetlands, including wetlands type conversion.

S.8.3 FULLY/EXTENSIVELY UNDERGROUND ALTERNATIVES (ALTERNATIVES 3, 4A, 4B, 4C, 6A, 6B)

The differentiators among the underground alternatives are the possible location of the planned converter station, the proposed route of the transmission line (along the existing/proposed transmission route or along various road corridors), and a 34-mile (50 km) overhead segment in the Southern Section. For the most part, these differences do not result in appreciably different impacts among these fully/extensively buried alternatives. Any important differences in impacts are noted.

Impacts to visual resources, tourism, recreation, and historic architectural resources would be less for the fully/extensively underground alternatives as compared to the overhead alternatives.

The underground alternatives would result in the highest construction cost (between $1.83 billion and $2.11 billion) and correspondingly the highest economic impacts as compared to the other action alternatives. Because construction costs would be higher, as compared to the other action alternatives, the revenue collected by local taxing jurisdictions along the transmission line would also be higher. For most of the fully/extensively underground alternatives, residential property values along the underground routes and associated residential property taxes would not be affected by these alternatives because long-term visual impacts would not occur. Some decrease in residential property values could occur in the Southern Section as a result of the 34-mile (50 km) overhead portion of the transmission line under Alternatives 6a and 6b.

The fully/extensively underground alternatives would require less vegetation removal and result in fewer impacts to archeological resources and wildlife, including protected species. During construction, blasting required for the underground alternatives would generate more noise than the overhead alternatives, which could impact noise receptors near the Project.

The underground alternatives would have a decreased risk for operational hazards such as damage from extreme weather or intentional destructive acts, and would present a higher risk of exposing contaminated soils or groundwater during construction, as compared to the overhead alternatives. Impacts to traffic and transportation would be greater for the alternatives located underground in roadway corridors than the overhead alternatives.

With respect to the proposed route of an underground transmission line, creation of a new route in the Northern Section under Alternative 3 would result in more disturbance to vegetation and wildlife than the underground alternatives that would follow existing roadways (Alternatives 4a, 4b, 4c, 6a, and 6b). Alternative 3 would have a long-term impact on up to 17 acres (7 ha) of wetlands, including wetland type conversion; Alternatives 4a, 4b, 4c, 6a, and 6b would have a long-term impact on up to 4 acres (2 ha) of wetlands.

Construction of the underground alternatives would result in greater impacts to soils and have more potential for erosion as compared to the overhead alternatives.

S.8.4 ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Under the No Action Alternative, there would be no impacts to any of the environmental resources analyzed. The local taxing jurisdictions would not realize any increases in tax revenues as a result of the Project and no direct or indirect economic impacts would occur within the region. No additional short-term or permanent jobs would be created. There would be no change in the wholesale price of electricity in New Hampshire or the ISO-NE region and no project related change in the level of CO_2 emissions.

S.9 SUMMARY OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROJECT

A summary of potential impacts from the construction, operation, maintenance, and emergency repairs associated with the Project (Alternatives 1, 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b) is presented in the following resource area discussions. **Chapter 3** (Affected Environment) summarizes the existing condition to provide context and explains analysis methods and critical terminology. The detailed impact analysis, along with Applicant Proposed Measures (APMs) to avoid or minimize potential impacts, is presented in **Chapter 4** (Environmental Impacts), **Chapter 5** (Cumulative Impacts), and **Appendix H** of this draft EIS.

S.9.1 VISUAL RESOURCES

Table S-2. Visual Resources Summary Impact Table

Alternative	Net Change in Average Scenic Impact	Total Average Scenic Impact	Miles (km) of Road Within Viewshed
1 (No Action)	0	1.62	0
2 (Proposed Action)	0.17	1.79	185 (298)
3	0	1.62	0
4a	0	1.62	0
4b	0	1.62	0
4c	0	1.62	0
5a	0.14	1.76	173 (278)
5b	0.16	1.78	186 (299)
5c	0.15	1.77	185 (298)
6a	0.04	1.66	43 (69)
6b	0.04	1.66	43 (69)

Note: The net change in visual resources is measured in comparison with the existing condition, or Alternative 1, which includes the existing PSNH transmission line. The existing condition has a visual magnitude rating of 1.67 (Very Low to Low), and a scenic impact rating of 1.62 (Very Low to Low). The existing PSNH transmission line crosses 178 roadways as an overhead line.
Refer to the Glossary for a definition of "scenic impact."

The methods used to determine the potential impact to visual resources are discussed in detail in **Chapter 3, Section 3.1.1**.

Overall, construction of the Project under all alternatives would result in short-term visual impacts from the presence of machinery and construction activities. For overhead portions of the Project (including portions of Alternatives 2, 5a, 5b, 5c, 6a, and 6b), overstory vegetation removal and the visibility of aboveground structures and facilities would result in long-term impacts to visual resources. The visibility of large industrial-appearing lattice structures that have high form and color contrast with existing transmission structures and the surrounding environment, along with vegetation clearing and the construction of a new transmission route would contribute to this impact. Additionally, other permanent facilities, such as transition stations, would alter the visual character of the landscape. Underground portions of the Project (including Alternatives 3, 4a, 4b, 4c, and portions of 2, 5a, 5b, 5c, 6a, and 6b) would not have long-term visual impacts from the transmission cable, but aboveground structures (transition stations, converter station, and substation) would have a visual impact.

S.9.2 SOCIOECONOMICS

Table S-3. Socioeconomic Resources Summary Impacts – Construction

Alternative	Total Construction Costs ($ billion)	Economic Impacts from Construction ($ million)		Annual FTE Construction Jobs (over three years)	Reduction of Taxable Assessed Property Values ($ million)	Reduction in Annual Residential Property Tax Payments ($)
		Direct	Total			
1 (No Action)	--	--	--	--	--	--
2 (Proposed Action	$1.061	$330.7	$564.1	5,369	$9.6	$260,000
3	$2.079	$648.2	$1,106.1	10,526	--	--
4a	$1.987	$620.2	$1,059.1	10,076	--	--
4b	$2.113	$658.3	$1,122.9	10,687	--	--
4c	$2.046	$638.2	$1,089.6	10,367	--	--
5a	$1.153	$358.1	$609.5	5,806	$8.8	$240,000
5b	$1.223	$379.5	$645.2	6,148	$9.4	$256,000
5c	$1.198	$371.8	$632.4	6,025	$8.8	$240,000
6a	$1.832	$571.2	$974.9	9,277	$4.4	$120,000
6b	$1.955	$608.6	$1,037.4	9,876	$4.4	$120,000

Table S-4. Socioeconomic Resources Summary Impacts – Operation, Maintenance, and Emergency Repairs

Alternative	Annual Economic Impacts ($ million)		Permanent FTE Jobs	Annual Reduction in Wholesale Electricity Costs – ISO-NE ($ million)	Annual Reduction in Wholesale Electricity Costs – NH ($ million)	Increase in Statewide Property Tax Annual Collections ($ million)	Percent Increase in Net Imported Electricity*
	Direct	Total					
1 (No Action)	--	--	--	--	--	--	--
2 (Proposed Action)	$55.6	$120.3	887	$149.4	$21.6	$29.0	37.7%
3	$80.5	$199.3	1,505	$133.8	$18.3	$57.2	31.1%
4a	$78.5	$193.6	1,461	$133.8	$18.3	$55.2	31.1%
4b	$81.0	$201.0	1,518	$133.8	$18.3	$57.8	31.1%
4c	$79.9	$197.8	1,493	$133.8	$18.3	$56.7	31.1%
5a	$53.8	$120.8	901	$133.8	$18.3	$30.6	31.1%
5b	$58.6	$129.0	954	$149.4	$21.6	$32.0	37.7%
5c	$54.7	$123.3	920	$133.8	$18.3	$31.4	31.1%
6a	$73.7	$179.4	1,352	$133.8	$18.3	$50.4	31.1%
6b	$76.2	$186.7	1,408	$133.8	$18.3	$52.9	31.1%

*Net imported electricity includes electricity delivered by the Project as well as other lines into ISO-NE from Canada.

The methods used to evaluate the socioeconomic effects of the Project are discussed in detail in **Chapter 3, Section 3.1.2**.

As depicted in **Table S-3**, total construction cost of the Project increases with increasing length of burial across the alternatives. Calculations of the overall economic impacts from construction of the Project is proportionate function of construction spending. Similarly, alternatives with higher construction costs would be expected to create more construction related employment. Construction of the Project may impact assessed residential property values and corresponding residential property tax payments to local taxing jurisdictions.

As summarized in **Table S-4**, ongoing operations, maintenance and repair of the Project would have lasting economic impact with New Hampshire and throughout the area served by ISO-NE. Overall economic impacts, permanent employment, and statewide property tax collections are a function of the assessed value of the Project which is directly tied to the capital cost of the Project and varies by alternative with the more costly alternatives having higher economic impacts, increased employment, and larger property tax collections.

Annual reductions in wholesale electricity costs (within NH and ISO-NE), and the percent increase in net imported electricity vary by the transmission capacity (1,200/1,000 MW) of the alternative.

Electricity generation from natural gas, oil, coal, and domestic hydropower would be expected to fall under all alternatives – slightly more with alternatives with a transmission capacity of 1,200 MW. Net imports, which includes electricity delivered by the Project as well as other lines into ISO-NE from Canada, would increase. Total net imports from Canada would provide no more than 20 percent of the total electricity supply to ISO-NE.

No studies have been completed documenting the potential impacts of transmission lines on tourism, and there is no existing literature with which to judge the potential impact of the Project on tourism in New Hampshire. However, impacts to tourism appear to be more affected by macroeconomic factors such as the stability of the national economy and gasoline prices more than site-specific changes. While it is reasonable to conclude that the Project may have some level of impact to tourism within New Hampshire, and to individual locations proximate to the Project route, these are not quantifiable.

S.9.3 RECREATION[15]

Table S-5. Recreational Resources With Potential to Experience Short-term Construction Impacts

Alternative	Point Sites	Potential Federal Wild and Scenic Rivers	Sites with Spatial Area acres (ha)	Trails	
				miles (km)	ANST[a] miles (km)
1 (No Action)	--	--	--	--	--
2 (Proposed Action)	1	1	493 (200)	5 (8)	0.1 (0.2)
3	1	1	493 (200)	5 (8)	0.1 (0.2)
4a	--	1	61 (25)	0.3 (0.5)	0.1 (0.2)
4b	--	1	82 (33)	0.3 (0.5)	0.1 (0.2)
4c	--	--	48 (19)	0.3 (0.5)	0.1 (0.2)
5a	1	1	287 (116)	0.9 (1.4)	0.1 (0.2)
5b	1	1	385 (156)	0.8 (1.4)	0.1 (0.2)
5c	1	1	339 (137)	0.9 (1.4)	0.1 (0.2)
6a	1	1	80 (33)	0.1 (0.2)	0.1 (0.2)
6b	--	1	101 (41)	0.1 (0.2)	0.1 (0.2)

[15] Maps of the Project study area for recreation, including all recreational resources considered in this analysis, can be found in the Recreation Technical Report (http://www.northernpasseis.us/library/draft-eis/technical-reports).

Table S-6. Recreational Resources With Potential to Experience Long-term Visual Impacts

Alternative	Point Sites	Potential Federal Wild and Scenic Rivers	Sites with Spatial Area acres (ha)	Trails	
				miles (km)	ANST[a] miles (km)
1 (No Action)	--	--	--	--	--
2 (Proposed Action)	5	1	663	4.1	0.1 (0.2)
3	--	--	--	--	--
4a	--	--	--	--	--
4b	--	--	--	--	--
4c	--	--	--	--	--
5a	4	1	563	3.3	0.1 (0.2)
5b	4	1	650	3.5	0.1 (0.2)
5c	4	1	618	3.4	0.1 (0.2)
6a	0	--	91	0	--
6b	0	--	91	0	--

[a] ANST impacts are included in the total impact to trails.
[b] Alternatives 3, 4a, 4b, and 4c would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures

Short-term construction impacts would include closures of recreational resources and disruption of normal recreational activities and would be limited to the duration of construction, maintenance, and emergency repairs. Regarding impacts to trails, it is likely that trails would be closed at the trailhead during construction, limiting recreational use of portions of these trails beyond the portion directly impacted by construction activities. Short-term construction impacts of underground cable installation could persist for a longer duration, due to the more involved nature of construction.

Construction and operation of an overhead transmission line (including periodic vegetation management) would result in long-term visual impacts. These impacts may detract from the experience of users by affecting their sense of primitiveness and remoteness. There would be no long-term visual impacts resulting from underground cable.

Both Alternative 2 and Alternative 3 would cross the ANST at the existing PSNH transmission line crossing, Alternative 2, as an overhead line, and Alternative 3, as an underground cable. Under all other alternatives the Project would cross the ANST as an underground cable within an existing roadway corridor.

S.9.4 HEALTH AND SAFETY

Table S-7. Health and Safety Summary Impact Table

Alternative	Summary of Impacts
1 (No Action)	No impacts.
2 (Proposed Action)	Risks related to spills, hazardous materials, petroleum products, hazardous wastes, worker safety, public safety, and fires would be minimized through the implementation of APMs (see **Appendix H**). In particular, design measures would reduce risks related to extreme weather events. The Project would generate electric and magnetic fields (EMFs), but there would be no impact of the Project due to EMFs outside of the transmission route, and minimal (not harmful) potential impacts due to AC electric fields within the transmission route.
3	Risks related to spills, hazardous materials, petroleum products, hazardous wastes, worker safety, and fires would be similar to those of Alternative 2. Risks related to weather, public safety, and EMFs would be reduced because the cable would be buried. There could be an increased risk of unearthing hazardous materials and/or contaminated groundwater.
4a	Risks would be similar to those of Alternative 3 because both alternatives would be underground cable, however, there could be more transportation-related risks because the cable would be buried in a roadway corridor.
4b	Same as Alternative 4a
4c	Same as Alternative 4a
5a	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
5b	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
5c	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
6a	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
6b	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions

The Project could result in short-term and long-term impacts to health and safety related to construction, operation, maintenance, and emergency repairs. In general, construction and operation of the Project could create and/or increase risks related to: spills/leaks of hazardous materials, petroleum products, and hazardous wastes; exposure of contaminated soils or groundwater; damage to underground pipelines and utilities; fire hazards; fire support services; worker safety; EMFs; extreme weather events and natural disasters; and general public safety concerns. These risks could be either short-term impacts from construction or maintenance activities, or long-term impacts resulting from operation of the Project. These risks could impact worker and public safety, as exposure to contaminated materials or a damaged transmission line can be dangerous.

Maintenance and emergency repair activities could include the same hazards as discussed for construction. Additional potential hazards during operation include EMFs, interference with an existing pipeline or utility, fallen lines or collapsed towers, lightning, extreme weather events, and fires at the transition stations, substations, or converter stations. The Applicant has committed to safety mitigation measures outlined in **Appendix H** and within the amended Presidential permit application.

Installation of underground cable in roadways could create increased risks for workers, but these risks would be minimized through a transportation management plan (see **Appendix H**).

EMFs generated by underground portions of the Project would be below accepted limits. Overhead portions of the line, including HVDC and HVAC portions, would generate EMFs which would have no impact

outside of the transmission route, and minimal impacts within the transmission route. There is no authoritative evidence that exposure to EMFs could increase or create a public health risk.

S.9.5 TRAFFIC AND TRANSPORTATION

Table S-8. Traffic and Transportation Impacts – Roads within Study Area and Miles (km) Buried in Roadway Corridors

Alternative	Roadways within Study Area					Miles (km) Buried in Roadway Corridor
	Interstates	US Highways	State Highways	Local Roads	Total	
1 (No Action)	--	--	--	--	--	--
2 (Proposed Action)	3	5	22	186	216	6 (10)
3	3	5	22	186	216	6 (10)
4a	3	6	22	440	471	173 (278)
4b	3	6	25	499	533	188 (303)
4c	3	6	22	574	605	179 (288)
5a	3	5	22	208	238	26 (42)
5b	3	5	22	199	229	19 (31)
5c	3	5	22	247	277	31 (50)
6a	3	5	22	413	443	137 (220)
6b	3	5	25	472	505	152 (245)

Note: The study area is defined as the Project corridors. The names and locations of all roadways are disclosed in the Traffic and Transportation Technical Report (http://www.northernpasseis.us/library/draft-eis/technical-reports).

Impacts to traffic along these roads would occur throughout the life of the Project, particularly during construction, maintenance, and emergency repairs. Impacts to roads in the study area would include short-term lane closures or full road closures resulting from the installation of the Project. For overhead portions of the Project, closures would be relatively short as the transmission line is suspended across the roadway. For portions of the Project located underground in roadway corridors, traffic closures would likely be longer in duration in order to excavate the trench in the road surface or shoulder.

For overhead portions of the Project, aviators flying in the area (including commercial and private planes) would be required to avoid new aboveground structures, but no impacts to air traffic are expected.

S.9.6 LAND USE

Table S-9. Land Use Summary Impact Table

Alternative	Land Use Conversion acres (ha)	Forest Plan Standards Inconsistencies
1 (No Action)	--	--
2 (Proposed Action)	454 (184) non-developed to Developed, Open Space	1) Forest-wide, Recreation General Standard S-2, 2) MA 8.3 – Appalachian National Scenic Trail, Recreation Standard S-2, 3) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1, and 4) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-2
3	454 (184) non-developed to Developed, Open Space	--
4a	28 (11) non-developed to Developed, Open Space	--
4b	28 (11) non-developed to Developed, Open Space	
4c	28 (11) non-developed to Developed, Open Space	--
5a	454 (184) non-developed to Developed, Open Space	--
5b	454 (184) non-developed to Developed, Open Space	1) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1
5c	454 (184) non-developed to Developed, Open Space	--
6a	28 (11) non-developed to Developed, Open Space	--
6b	28 (11) non-developed to Developed, Open Space	--

The majority of the Project would be located either in the existing PSNH transmission route (Alternatives 2, 3, and portions of 5a, 5b, 5c, 6a, and 6b) or in an existing roadway corridor (Alternatives 4a, 4b, 4c, and portions of 5a, 5b, 5c, 6a, and 6b). Where the Project is located in these areas there would be no change to the existing land use. The portion of new transmission route in the Northern Section would result in the conversion of currently non-developed land into Developed, Open Space. This conversion could limit future uses of this private land.

Table S-9 summarizes potential impacts of the Project as they relate to USFS management of National Forest System (NFS) lands. The Forest Plan provides guidance for managing and protecting natural resources and our visitors' experiences on all National Forest lands. Standards and guidelines are the

specific, technical direction for managing resources. Forest-wide standards and guidelines apply across all WMNF lands and management activities, unless more restrictive direction exists for a management area (MA). Management Area standards and guidelines apply only to land allocated to a specific MA. Forest-wide, and within MAs, a *standard* is a course of action that must be followed, or a level of attainment that must be reached, to achieve management goals and objectives, and can only be changed through an amendment to the Forest Plan. A *guideline* also is a required course of action or level of attainment, but permits operational flexibility to respond to variations in conditions. Guidelines can be modified or not implemented if site-specific conditions warrant, but the rationale for doing so must be documented in a project-level analysis and signed decision.

Impacts to conservation lands (parcels that are mostly undeveloped and protected from future development) would occur during construction, operation, maintenance, and emergency repairs. Construction impacts (e.g., vegetation clearing) to aesthetic, wildlife, water, and recreation values of these lands would be short-term. Long-term impacts would include diminishment of landscape character, fragmentation of wildlife habitat, impacts to stream health, riparian habitat, wetlands, and vernal pools, and effects to the recreation experience. These impacts would be in addition to those already occurring from the existing PSNH transmission line. Impacts would be less for alternatives located underground in roadway corridors, where there are limited conservation values currently. Refer to the analyses of impacts to Visual Resources (see **Section S.9.1**), Recreation (see **Section S.9.3**), Wildlife (see **Section S.9.11**), Vegetation (see **Section S.9.12**), and Water Resources (see **Section S.9.13**) for more information.

No impacts to federally designated Wild and Scenic Rivers would be expected under any alternative. State protected rivers are located in the study area, and the Applicant would be required to comply with certain protection measures.

Portions of the Project located underground in roadway corridors could complicate future use of these ROWs, including NHDOT road maintenance and future utility installations.

The portion of the Alternative 3 corridor which would be located within the existing PSNH transmission route is governed by more than 644 separate easements or other agreements. A review of a representative sampling these easements indicates the majority of the easements do not grant the Applicant the authority to install or operate underground transmission cables within the land governed by the easements. Therefore, in order for Alternative 3 to be implemented, the majority of these easements would need to be amended through agreement with each individual land owner. This aspect of Alternative 3 may be challenging to implement. The analysis of Alternative 3, within this draft EIS, ensures that the potential environmental impacts from any combination of above and below ground placement of the Project within the Proposed Action route is bounded by the analysis.

S.9.7 NOISE

Table S-10. Noise Summary Impact Table

Alternative	Audible Corona Noise Level (dBA) During Operations			Exceed EPA Guidance Level of 55 dBA
	HVDC Transmission Line (below conductors)	345 kV AC Transmission Line (below conductors)	345 kV AC Transmission Line (150 feet [46 m] from centerline)	
1 (No Action)	--	--	--	--
2 (Proposed Action)	28	44	36	No
3	No audible corona noise associated with underground lines			
4a	No audible corona noise associated with underground lines			
4b	No audible corona noise associated with underground lines			
4c	No audible corona noise associated with underground lines			
5a	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
5b	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
5c	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
6a	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
6b	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			

Noise impacts from construction would occur for all action alternatives on a short-term basis. These impacts would result from the operation of construction equipment, blasting, and other construction activities. APMs presented in **Appendix H** would limit the timing and reduce the duration of these impacts. APMs would be expected to keep noise levels below United States Department of Transportation (USDOT) guidelines throughout Project construction. Construction noise could be more impactful for alternatives including burial in roadway corridors because these alternatives would be located in closer proximity to residences and sensitive noise receptors.

The audible noise due to the corona effect would not exceed the EPA guidance level Ldn of 55 dBA for outdoor areas beyond the transmission line. There would be no audible corona noise associated with underground portions of the Project.

Ongoing maintenance activities would include periodic transmission route maintenance activities (e.g., mowing) and routine road maintenance such as grading to maintain the private and public dirt and gravel access roads in a passable condition. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations, and noise generated during helicopter inspections would be short-term and localized.

S.9.8 HISTORIC AND CULTURAL RESOURCES

Table S-11. Number of Archaeological Resources Potentially Impacted during Construction

Alternative	Within Direct APE	NRHP-Listed	NRHP-Eligible	Not Yet Evaluated for NRHP Eligibility
1 (No Action)	--	--	--	--
2 (Proposed Action)	49	--	--	49
3	49	--	--	49
4a	30	--	--	30
4b	35	--	--	35
4c	36	--	--	36
5a	44	--	--	44
5b	52	--	--	52
5c	57	--	--	57
6a	36	--	--	36
6b	41	--	--	41

Table S-12. Number of Archaeologically Sensitive Areas Potentially Impacted during Construction

Alternative	Within Direct APE	Total Land Area within Potentially Disturbed Areas acres (ha)
1 (No Action)	--	--
2 (Proposed Action)	255	85 (34)
3	252	88 (36)
4a	174	117 (47)
4b	216	130 (53)
4c	270	146 (59)
5a	233	76 (31)
5b	252	83 (34)
5c	273	78 (32)
6a	198	136 (55)
6b	241	149 (60)

Table S-13. Number of Architectural Resources Potentially Impacted during Construction

Alternative	Within Indirect APE	Within Direct APE	NRHP-Listed or -Eligible (within Indirect APE)	Not Yet Evaluated for NRHP Eligibility (within Indirect APE)
1 (No Action)	--	--	--	--
2 (Proposed Action)	163	33	17	146
3	162	32	16	146
4a	231	226	51[a]	173
4b	263	253	53[a]	203
4c	351	319	59[a]	285
5a	164	56	18	146
5b	163	37	18	145
5c	169	52	18	151
6a	219	190	27	192
6b	250	216	29	221

Potentially affected cultural resources and historic and cultural properties were identified based on a defined study area called the Area of Potential Effects (APE). DOE consulted with the NHDHR and additional Section 106 consulting parties to define the APE for the Project. The direct APE consists of the area that could be directly physically impacted by the Project. The indirect APE consists of the area in which other impacts, such as visual impacts, could occur.

NRHP eligibility has not yet been determined for all archaeological resources potentially impacted as identified in Project-specific surveys to date; this determination would occur prior to construction, but after a final route has been selected or potentially approved. Both short- and long-term adverse effects to archaeological resources (or sites) and archaeologically sensitive areas from construction of the Project would potentially result from surface and subsurface ground disturbance.[16]

Construction activities would have the potential to result in short-term, adverse visual impacts on architectural resources for the duration of construction activities. These visual impacts would have the potential to temporarily alter the setting of these architectural resources, as well as temporarily alter views of and from these resources. In addition, construction activities would have the potential for long-term, adverse effects on architectural resources that are located within disturbance areas and which are removed or damaged during construction. Long-term, adverse visual impacts on these resources could occur if they result in changes to the settings of, or views to and from, these architectural resources.

Proposed APMs to avoid, minimize or mitigate adverse effects to cultural resources and historic and cultural properties have been developed by Northern Pass and are listed in **Appendix H**. These APMs would be continually developed as part of DOE's ongoing review of the Project through the Section 106 process.

DOE will continue to consult with the New Hampshire Division of Historic Resources (NHDHR) and Advisory Council on Historic Preservation (ACHP), as well as consulting parties, to complete the National Historic Preservation Act (NHPA) Section 106 process.

[16] Within archaeologically sensitive areas, there is considered to be a higher likelihood of encountering archaeological resources (sites).

S.9.9 ENVIRONMENTAL JUSTICE

A detailed evaluation of U.S. Census block group data compared the demographic composition of "potentially affected" population (residing within 1,000 feet [305 m] of the Project) against the surrounding "unaffected" population on a county-by county basis. This evaluation was performed separately for the Proposed Action and for each alternative. Three specific demographic measures were identified for each block group: the percentage of minority residents, the median household income, and the percentage of families living below the poverty level.

The demographic composition of the "potentially affected" groups compared to the surrounding "unaffected" population shows very little to no differences in the percentage of minority residents, percentage of families living below the poverty level, and median household income levels. Therefore, in compliance with EO 12898, no disproportionately high and adverse human health or environmental effects are expected to affect minority or low-income populations under any of the action alternatives. Specific demographic data is presented for each geographic section in **Chapter 4**, **Sections 4.2.9, 4.3.9, and 4.4.9**.

S.9.10 AIR QUALITY

Table S-14. Construction Emissions and Loss of CO_2 Uptake from Vegetation Removal

Alternative	Construction Emissions (metric tons) Entire Construction Period			Loss of Carbon Dioxide Uptake from Vegetation Removal (metric tons per year)	Reduction in CO_2 Emissions from Implementation (million tons per year)	Percent Reduction in CO_2 Emissions (compared with existing conditions)
	Nitrous Oxides (NO_x)	Carbon Monoxide (CO)	Carbon Dioxide (CO_2)			
1 (No Action)	--	--	--	--	--	--
2 (Proposed Action)	374	238	93,954	932	3.5	11%
3	164	150	33,734	266	2.9	9%
4a	134	124	27,663	127	2.9	9%
4b	141	130	28,910	145	2.9	9%
4c	140	129	29,998	162	2.9	9%
5a	370	244	91,917	828	2.9	9%
5b	383	250	95,312	906	3.5	11%
5c	374	247	92,638	847	2.9	9%
6a	183	149	41,440	115	2.9	9%
6b	190	155	42,687	133	2.9	9%

Under all action alternatives, construction of the Project would result in the short-term emissions of nitrogen oxides, carbon monoxide, and carbon dioxide. Because portions of the Southern Section are located within nonattainment or maintenance areas, the Conformity Rule would apply.[17] However, construction emissions would not exceed General Conformity *de minimis* thresholds within the applicable counties. Additionally, vegetation removal associated with construction (widening the existing, or creating a new, transmission route, and other infrastructure such as the converter station) would result in the loss of CO_2 uptake capacity. Additionally, the construction of the Scobie Pond Substation would result in the short-term emission of less

[17] The towns of Allenstown, Pembroke, and Concord, NH, in Merrimack County and the Deerfield, NH, in Rockingham County have been designated as the Central New Hampshire area, which is in nonattainment for the 2010 SO_2 NAAQS.

than 3 metric tons of NO_x, approximately 2 metric tons of CO, and 601 metric tons of CO_2. This impact would be identical for all alternatives.

The electricity provided to the ISO-NE region from the Project could result in a decrease in the use of fossil fuels for thermal electricity generation. The reduction in CO_2 emissions from implementation of the Project could be approximately 3.4 million tons of CO_2 per year, over an 8 percent decrease from existing levels for alternatives with a 1,200 MW capacity, or 2.8 million tons of CO_2 per year, over an 7 percent decrease from existing levels for alternatives with a 1,000 MW capacity.

S.9.11 WILDLIFE

Table S-15. Wildlife Habitat Impacts

Alternative	Impacts to Wildlife Habitat acres (ha)
1 (No Action)	--
2 (Proposed Action)	1,217 (493)
3	1,038 (420)
4a	253 (102)
4b	270 (109)
4c	261 (106)
5a	1,119 (453)
5b	1,188 (481)
5c	1,127 (456)
6a	262 (106)
6b	279 (113)

A total of 9 federally- and 29 state-listed wildlife species have the potential to occur in the study area and were therefore considered in this analysis. For the majority of these federally- and state-listed species, there is no difference in effects determinations between action alternatives. For the species with differences, the results are presented below.

Table S-16. Determination Summary of Project-wide Effects for Federally-Listed Wildlife Species

Species[a]	Determination of Effects by Alternative[b]
Karner Blue Butterfly (*Lycaeides melissa samuelis*) FE, SE	**Impact For Alternatives 2, 3, 5a, 5b, 5c, 6a, and 6b:** Localized, short-term effects resulting from disturbance/displacement during construction and maintenance actions, particularly in the Southern Section where wild lupine stands (the Karner Blue Butterfly host-plant) exist. **ESA Determination for Alternatives 2, 3, 5a, 5b, 5c, 6a, and 6b:** "May Affect, and is Likely to Adversely Affect" **ESA Determination for Alternatives 4a, 4b, and 4c:** "No Effect" (Suitable habitat not located in study area)
Canada Lynx (*Lynx canadensis*) FT	**Impact for All Alternatives:** No lynx or suitable denning habitat located within study area; suitable foraging habitats are prevalent throughout the Northern Section. **ESA Determination for Alternatives 2, 3, 5a, 5b, and 5c:** "May Affect, but is not Likely to Adversely Affect" **ESA Determination for Alternatives 4a, 4b, 4c, 6a, and 6b:** "No Effect" (Suitable habitat not located in study area)

Notes:
[a] The species identified are only those with differences in effects determinations between action alternatives. All other species have the same effects determinations for all action alternatives.
[b] Study area is defined as the extent of disturbance for each of the alternatives.
DOE (or its sub consultant) has made the determinations, based on the most current analysis to-date. Future coordination/ consultation with the USFWS, USFS, and NHFG, may influence the final determinations.
Suitable habitat is located within the study area unless otherwise noted.
Key: FT = federally-threatened; FE = federally-endangered; SE = state-endangered; ST = state-threatened

Table S-17. Summary of Project-wide Effects for State Threatened and Endangered Wildlife Species

Species[a]	Effects by Alternative[b]
Fish	
Bridle Shiner (*Notropis bifrenatus*) ST	**Alternative 2, 5a, 5b, and 5c:** No effect for construction and maintenance actions. **Buried Alternatives in Central and Southern Sections (including sections of Alternatives 3, 4a, 4b, 4c, 6a, and 6b)**: localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Invertebrates	
Brook Floater Mussel (*Alasmidonta varicosa*) SE	**Alternative 2, 5a, 5b, 5c, 6a, 6b:** No effect for construction and maintenance actions. **Buried Alternatives in Southern Section (including sections of Alternatives 3, 4a, 4b, 4c)**: localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.

Notes:
[a] The species identified are only those with differences in effects determinations between action alternatives. All other species have the same effects determinations for all action alternatives.
[b] Study area is defined as the extent of disturbance for each of the alternatives.
DOE (or its sub consultant) has made the determinations, based on the most current analysis to-date. Future coordination/ consultation with the USFWS, USFS, and NHFG, may influence the final determinations.
Key: FT = federally-threatened; FE = federally-endangered; SE = state-endangered; ST = state-threatened

Impacts to terrestrial species could result from direct mortality or injury to individuals, sensory disturbance, and increased depredation. Construction of the Project would result in habitat loss and modification. Habitat loss and/or modification of existing habitats in the study area during construction would also have adverse

impacts on wildlife resources. The potential for wildlife collisions with vehicles traveling during construction along access roads or Project corridors would increase, causing increased mortalities and/or injuries. Populations of most wildlife species are prevalent in the state and individuals from adjacent undisturbed habitats would be expected to return to the Project corridors following construction. Adverse impacts to wildlife in the form of mortality or physical injury could occur, however, no population-level effects are expected and the majority of adverse effects would be short-term

Impacts to aquatic species could result from direct mortality or injury to individuals, sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation. With the application of APMs, avoidance of in-stream disturbance, and restoration of aquatic habitat following construction (see APMs in **Appendix H**), impacts to aquatic species would be minimized. Underground portions of the Project would result in additional impacts to aquatic species resulting from construction activity at waterbody crossings. Impacts would include habitat disturbance in the trench area and suspension of sediments, resulting in short-term, adverse impacts at the specific waterbody crossings. Impacts to aquatic habitat, including bank and channel disturbance, could be avoided through the use of horizontal directional drilling (HDD).

S.9.12 VEGETATION

Table S-18. Vegetation Summary Impact Table

Alternative	Impacts to Vegetated Habitats (including Forestlands) acres (ha)	Impacts to Forestlands acres (ha)
1 (No Action)	--	--
2 (Proposed Action)	1,093 (442)	692 (280)
3	919 (372)	181 (73)
4a	230 (93)	80 (32)
4b	243 (98)	89 (36)
4c	228 (92)	97 (39)
5a	993 (402)	609 (246)
5b	1,062 (430)	668 (270)
5c	998 (404)	618 (250)
6a	239 (97)	84 (34)
6b	253 (102)	93 (38)

A total of 94 federally- and state-listed plant species have the potential to occur in the study area and were therefore considered in this analysis. For the majority of these federally- and state-listed species (50 total species), there is no difference in effects determinations between the action alternatives. For these species, the following effects determination applies: "No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs (**Appendix H**), no population-level impacts are expected."

For two species analyzed (alpine brook saxifrage and Robbins' cinquefoil), it was determined that there is no suitable habitat in the study area and there would therefore be no effect. No federally-listed small whorled pogonia individuals were identified during Project-specific surveys or in state databases, but if populations are present in the study area, impacts to individuals could occur but no population-level impacts are expected. The ESA determination for the small whorled pogonia for all action alternatives is: "May Affect, but Not Likely to Adversely Affect." For all species considered, no population-level impacts are expected from any action alternative.

Table S-19 presents the effects determinations for species which vary among the action alternatives.

Table S-19. Comparison of Project-wide Effects for State-Listed Plant Species

Species	Effects by Alternative
Allegheny-vine/Climbing fumitory (*Adlumia fungosa*), SE	**Impacts for Alternatives 4a, 4b, and 4c:** Known populations in the study area in Lancaster, NH based on NHB data (NHB 2014); impacts to individuals are expected; with the application of APMs, no population-level impacts are expected. **Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, and 6b:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Alpine manzanita (*Arctostaphylos alpina*), RFSS	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Red threeawn (*Aristida longespica* var. *geniculata*), SE	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, and 6b:** Known populations in the study area in the towns of Concord and Pembroke based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, and 4c:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Clasping milkweed (*Asclepias amplexicaulis*), ST	**Impacts for Alternatives 2, 3, 5a, 5c, 6a, and 6b:** Known populations in the study area in the Town of Concord based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, 4c, and 5b**: if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Dwarf white birch (*Betula minor*), RFSS	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Wiegand's sedge (*Carex wiegandii*), RFSS, SE	**Impacts for Alternatives 2 and 3:** Known populations in the study area in the Town of Lincoln based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Diapensia (*Diapensia lapponica*), ST	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.

Table S-19. Comparison of Project-wide Effects for State-Listed Plant Species

Species	Effects by Alternative
Mountain avens (*Geum peckii*), RFSS, ST	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Wild lupine (*Lupinus perennis*) ST	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, and 6b:** Project-specific floristic surveys and NHB data (NHB 2014) identified several populations in Concord and Pembroke, NH within the study area; impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, and 4c:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Alpine arctic cudweed (*Omalotheca supine*), RFSS, SE	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Mountain sorrel (*Oxyria digyna*), ST	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Boott's rattlesnake-root (*Prenanthes boottii*), RFSS, ST	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Satiny willow (*Salix pellita*), SE	**Impacts for Alternatives 4a, 4b, 4c, 6a, and 6b:** Known populations in the study area in the towns of Clarksville and Stewartstown, based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 2, 3, 5a, 5b, and 5c:** If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Arizona cinquefoil (*Sibbaldia procumbens*), RFSS	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.

Table S-19. Comparison of Project-wide Effects for State-Listed Plant Species

Species	Effects by Alternative
Moss campion (*Silene acaulis* var. *exscapa*), RFSS	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No effect, study area does not cross suitable habitat.

Source: NHNHB 2013 and USDA Forest Service 2012
Notes: Geographic regions were identified using the USDA NRCS (2015a).
Key: RFSS = Regional Forester Sensitive Species; SE = state-endangered; ST = state-threatened

Both short-term and long-term impacts to vegetation would occur during construction, resulting from vegetation disturbance and overstory vegetation removal. Long-term impacts would also result from operation, maintenance, and emergency repairs resulting from ongoing vegetation removal. Impacts would consist of those relating to clearing of vegetation for tower installation or line burial, service roads, and staging areas along and within the transmission route, access roads, converter stations, and substations (including the potential removal of listed plant species), maintenance of vegetation clearing so as not to interfere with aboveground or underground components, as well as the short-term and long-term disturbance in sensitive habitats.

Forestlands located within the Project corridors would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted to scrub-shrub and herbaceous wetland communities, which would persist during operation of the Project. Implementation of APMs listed in **Appendix H**, including vegetation management and maintenance in accordance with the NHDFL's *Best Management Practices for Utility Maintenance,* would minimize adverse effects related to the Project. The conversion of forestlands to herbaceous or shrub communities would change the vegetation community species composition and suitability for a variety of wildlife species but would not be expected to have any population-level effects to vegetation resources because the majority of affected vegetation species are abundant in other parts of the state and region.

Invasive plant species, including noxious weeds, could be introduced and spread through introduction of plant propagules on construction equipment. Soil disturbance and compaction could potentially present conditions for such species to colonize, potentially resulting in both short-term and long-term adverse impacts. Implementation of the APMs (**Appendix H**), specifically an Invasive Species Management Plan, would minimize impacts to vegetation resources. Alternatives including buried transmission cable could have an increased risk for spreading invasive plant species because the areas of linear exposed soils could provide conditions for such species to colonize.

Fragmentation of contiguous vegetation communities or mature forest blocks associated with the creation and maintenance of a new transmission route in the Northern Section (included in Alternatives 2, 3, 5a, 5b, and 5c) is a potential long-term impact that would extend throughout operation. It should be noted that for shade-tolerant plants, forest fragmentation and the creation of a new transmission route would decrease the extent of suitable habitat. However, the creation of a new transmission route would create new habitat for a variety of shade intolerant species.

Loss of forest cover in the transmission route could result in a potential long-term loss of biodiversity. However, the loss of forest cover in the transmission route and alterations of species composition along the transmission route edges would not result in regional impacts because the size of the impacted area would be negligible compared to the extensiveness of forest cover in surrounding areas. Plant species diversity could potentially increase locally through maintenance of the transmission routes in early successional plant

communities, and potential creation of early successional wetlands in poorly drained areas. Any potential long-term effects associated with fragmentation and loss of biodiversity would be less for the underground cable due to the narrower transmission route (including portions of new transmission route in the Northern Section) and the previously-disturbed nature of roadway corridors.

S.9.13 WATER RESOURCES

Table S-20. Water Resources Summary Impact Table

Alternative	Wetland Disturbance acres (ha)			Impacts to Vernal Pools acres (ha)	Disturbance in Locations Overlying Aquifers acres (ha)	Disturbance in FEMA Flood Zones[a] acres (ha)	Miles (km) of Impaired Rivers Crossed
	Direct	Temporary	Secondary				
1 (No Action)	--	--	--	--	--	--	--
2 (Proposed Action)	26 (11)	82 (33)	8 (3)	0.2 (0.1)	453 (183)	1,196 (484)	0.3 (0.5)
3	2 (1)	162 (66)	4 (2)	0.2 (0.1)	452 (183)	1,003 (406)	0.4 (0.6)
4a[b]	2 (1)	8 (3)	<0.1 (<0.04)	--	216 (87)	255 (103)	0.3 (0.5)
4b[b]	2 (1)	8 (3)	0.3 (0.12)	--	226 (91)	272 (110)	0.3 (0.5)
4c[b]	2 (1)	8 (3)	<0.1 (<0.04)	--	219 (89)	262 (106)	0.3 (0.5)
5a	25 (10)	69 (28)	8 (3)	0.2 (0.1)	462 (187)	1,097 (444)	0.3 (0.5)
5b	25 (10)	78 (32)	8 (3)	0.2 (0.1)	464 (188)	1,166 (472)	0.3 (0.5)
5c	25 (10)	69 (28)	8 (3)	0.2 (0.1)	471 (191)	1,106 (448)	0.3 (0.5)
6a[b]	3 (1)	9 (4)	<0.1 (<0.04)	--	343 (139)	259 (105)	0.2 (0.3)
6b[b]	3 (1)	9 (4)	<0.1 (<0.04)	--	352 (143)	276 (112)	0.2 (0.3)

[a] Including all FEMA Flood Zones (Zone A, Zone AE, and Zone X).
[b] No vernal pools were identified in the Project corridor. Additional surveys may be conducted, as necessary.

The Project would result in short-term and long-term impacts to water resources related to construction, operation, maintenance, and emergency repairs. Overhead configurations would span the majority of streams, rivers, and riparian areas and minimize impacts to these resources. In areas where transmission cables would be buried, measures would be taken to minimize impacts, including directionally boring under larger channels and replacing culverts where necessary. Although there would be some secondary water quality and habitat effects from canopy reduction, mitigation would be undertaken to address those effects. APMs to minimize water resource and wetland impacts can be found in **Appendix H**.

Direct impacts to wetlands include permanent construction, temporary impacts include clearing but no loss of function within various wetland types. Secondary impacts include the conversion of palustrine forested (PFO) wetlands to palustrine emergent (PEM) and palustrine scrub-shrub (PSS) wetlands within a 100-ft buffer near stream crossings. Wetland impacts would be much less extensive under alternatives located underground in roadway corridors because there are fewer wetland resources adjacent to roadways compared with the new transmission route and existing PSNH transmission route, and the area of disturbance for these alternatives is smaller (i.e., much disturbance would occur on a road surface). Impacts to wetlands under Alternative 3 are considered temporary, however, due to the amount of trenching proposed, there would be an increased risk of damage to wetland function and values.

Water resources potentially affected by construction would include watersheds, surface water, groundwater, floodplains, and wetlands. General short-term construction impacts related to construction activities would include changes or modification of groundwater or surface water (streams and rivers) quantity and/or quality, potential sedimentation, changes in water flow patterns, increased bedrock fracturing near rock

blasting areas (temporarily affecting turbidity in groundwater wells near the blast zone), and increased turbidity in surface water. In general, aboveground facilities would be able to span wetlands and waterbodies, thereby reducing potential impacts.

Impacts to water resources from underground construction would be similar to aboveground construction, except that soil disturbance and resulting erosion and sedimentation would be greater from short-term construction activities, such as excavation of the trench. Trenching would result in impacts on water quality from increased turbidity, potential downstream sedimentation, changes in water flow patterns, and increased likelihood of pollutants reaching waterbodies. Stream crossings could include installation methods for minimizing short-term construction impacts to water quality including trenching or HDD, and/or attaching to existing infrastructure such as bridges. HDD would have the potential for leaks of HDD drilling fluid, which could cause drilling fluid to become suspended or dispersed, impacting water quality.

All action alternatives also include an expansion of the Scobie Pond Substation. This activity would impact 0.2 acre (0.1 ha) of wetlands, no vernal pools, 5 acres (2 ha) overlying aquifers, 5 acres (2 ha) in FEMA flood zones, and less than 0.1 mile (0.2 km) of CWA 303(d) impaired waterbodies. The impacts of other structures, including converter stations and the Deerfield Substation, are captured in **Table S**.

S.9.14 GEOLOGY AND SOILS

Table S-21. Geologic and Soil Resources Summary Impact Table

Alternative	Total Ground Disturbance acres (ha)	Disturbance to All Hydric Soils acres (ha)	Disturbance to Prime Farmland, Farmland of Statewide Importance, or Farmland of Local Importance acres (ha)
1 (No Action)	--	--	--
2 (Proposed Action)	1,217 (493)	20 (8)	264 (107)
3	1,038 (420)	40 (16)	285 (115)
4a*	275 (111)	4 (2)	105 (43)
4b*	292 (118)	5 (2)	115 (47)
4c*	291 (118)	5 (2)	119 (48)
5a*	1,119 (453)	19 (8)	234 (95)
5b*	1,188 (481)	20 (8)	262 (106)
5c*	1,127 (456)	19 (8)	244 (99)
6a*	276 (112)	3 (1)	139 (56)
6b*	293 (119)	3 (1)	148 (60)

* For alternatives buried in road corridors, total ground disturbance would depend on whether the cable was buried in the roadway centerline or in one of the shoulders. The total ground disturbance would be less if buried in the roadway centerline. The figures shown in the table are the maximum amount that could occur under each alternative.

The majority of soil impacts would be short-term and occur during the construction phase. Overstory vegetation removal and ground disturbance associated with clearing and widening the transmission route, constructing laydown areas, and other construction activities would likely result in short-term soil erosion. These impacts would be expected to be localized and extend primarily through the construction period, especially if these features are returned to their pre-existing condition.

Long-term soil impacts would result from clearing and grading for permanent access/maintenance roads, transmission structures, transition stations, converter stations, and the expansion of the Deerfield Substation. These activities could result in compaction and erosion.

The impact of underground cable, and particularly Alternative 3, would be greater than for an overhead line. While the total area of ground disturbance for alternatives including overhead transmission is greater than the area of disturbance for underground cable, the impacts would be more intense for underground cable. The disturbed transmission route for underground cable installation would be exposed to erosion during construction, particularly on the steeper slopes and more highly erodible soils. Underground cable installation would require more grading, trenching, and other excavation along with backfilling resulting in more soil disturbance and exposure to erosion during construction. Impacts on soils from construction of the underground cable using directional drilling would be localized and impacts would not be expected with the implementation of APMs for erosion, sediment control, and restoration of the disturbed Project corridor (see **Appendix H**). The impact of cable burial in roadway corridors would be generally less than burial in the new or existing PSNH transmission route because much of the disturbance would be limited to the road surface.

S.9.15 CUMULATIVE IMPACTS

Cumulative impacts are presented in **Chapter 5**, **Section 5.1** for all alternatives and resources considered. Past, present, and reasonably foreseeable future actions that could, with implementation of the Project, have cumulative environmental impacts are listed in **Appendix D**.

Alternatives that involve the majority of the transmission line being constructed aboveground (Alternatives 2, 5a, 5b, and 5c) would result in vegetation clearing, disturbances to wildlife, removal of wildlife habitat types, direct mortality of certain wildlife individuals, soil disturbance and erosion, stormwater runoff, increased noise levels, increased construction traffic, increased short-term air emissions, decreased long-term air emissions, changes in land use for the new transmission line route, increases in health and safety concerns, changes in socioeconomic indicators, and potential impacts to historic and cultural resources. Multiple activities occurring at the same time and in the same vicinity would have greater impacts than just one project. Alternatives 2, 5a, 5b, and 5c would result in a moderate contribution to cumulative impacts on visual resources and soils and geology; a moderate beneficial contribution to cumulative impacts at a more localized scale on socioeconomics; a minor contribution to cumulative impacts on recreation, health and safety, noise, wildlife, and water resources; a negligible contribution to cumulative impacts on land use; no cumulative impact to environmental justice; and a long-term beneficial contribution to cumulative impacts on air quality. Alternative 2 would result in a negligible contribution to cumulative impacts on traffic and transportation. Alternatives 5a, 5b, and 5c would result in a substantial short-term contribution to traffic and transportation. Depending on the resource, the impacts would be short-term and/or long-term in duration.

Alternatives that involve the majority of the transmission line being buried (Alternatives 3, 4a, 4b, 4c, 6a, and 6b) would result in limited vegetation clearing and impacts to wildlife and wildlife habitat, direct mortality to certain wildlife species, soil disturbance and erosion, stormwater runoff, increased noise levels, increased construction traffic and traffic delays along roadways, increased short-term emissions, decreased long-term air emissions, limited changes to land use, increases in health and safety concerns and roadway workers, changes in socioeconomic indicators, and potential impacts to historic and cultural resources. The alternatives that would be constructed underground along existing roadways (Alternatives 4a, 4b, 4c, 6a, and 6b) would impose the fewest environmental impacts due to the lack of visual impacts and use of already disturbed roadway corridors. Multiple activities occurring at the same time and in the same vicinity would have greater impacts than just one project. Alternatives 3, 4a, 4b, 4c, 6a, and 6b would result in a moderate beneficial contribution to cumulative impacts at a more localized scale on socioeconomics; a minor contribution to cumulative impacts on noise, vegetation, and water resources; a negligible contribution to cumulative impacts on visual resources, recreation, health and safety, and land use; no cumulative impact to environmental justice; and a long-term beneficial contribution to cumulative impacts on air quality. Alternative 3 would result in a moderate contribution to cumulative impacts on soils and geology; a minor contribution to cumulative impacts on wildlife; and a negligible contribution to cumulative impacts on

traffic and transportation. Alternatives 4a, 4b, 4c, 6a, and 6b would result in a substantial short-term contribution to cumulative impacts on traffic and transportation and a negligible contribution to cumulative impacts on soils and geology. Depending on the resource, the impacts would be short-term and/or long-term in duration.

S.10 INDEX

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APPENDIX A
MAPS

APPENDIX A: MAPS

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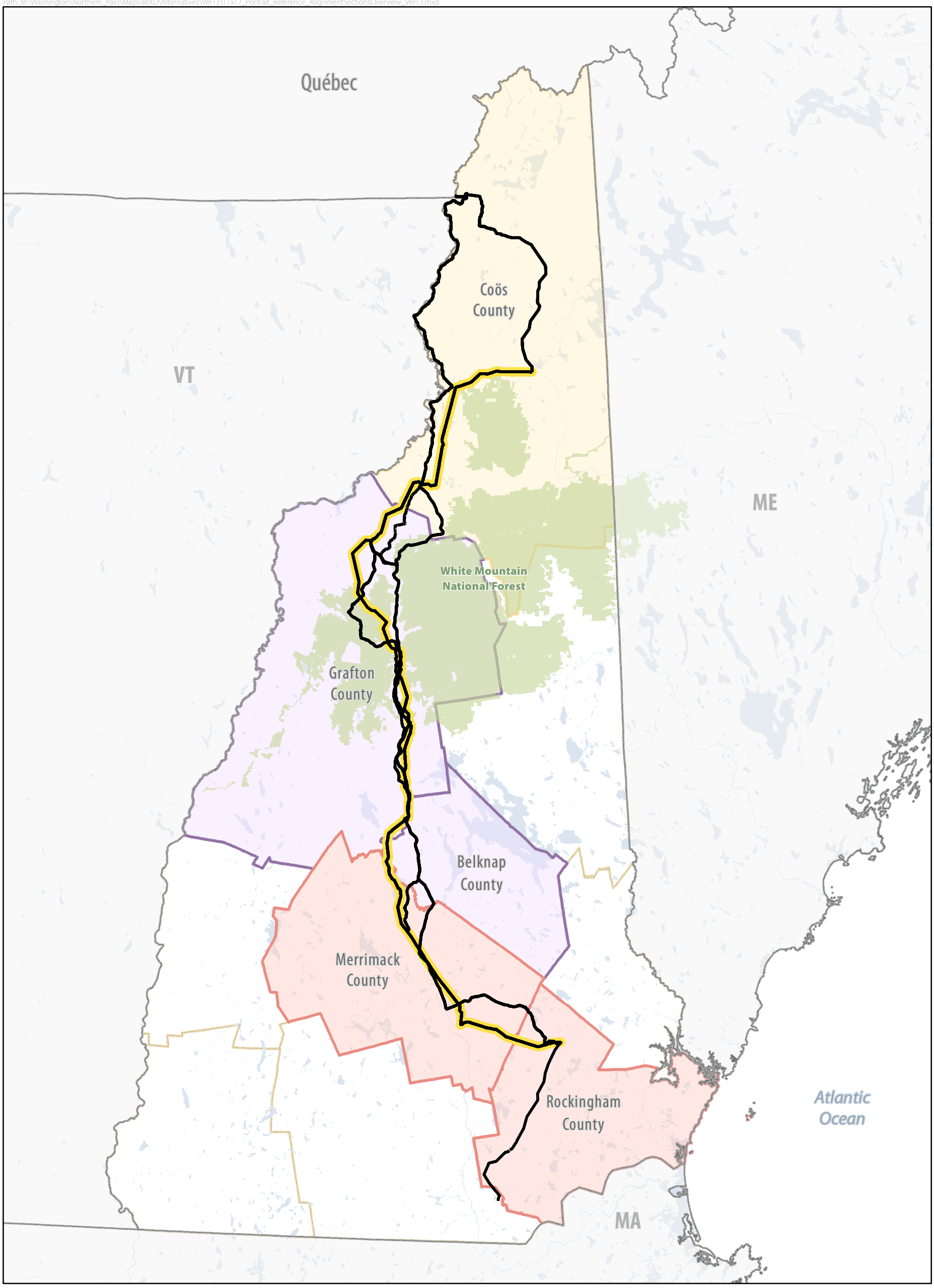

Legend

- State Boundary
- County Boundary
- Alternative Project Alignment
- Waterbody
- White Mountain National Forest

Section Boundaries

- Northern Section
- Central Section
- Southern Section
- Existing PSNH Transmission Route

SOURCE: ESRI 2011; Ecology and Environment 2014.

Map 1:
Vicinity Map and Project Sections
Northern Pass Transmission Line Project
Environmental Impact Statement

N

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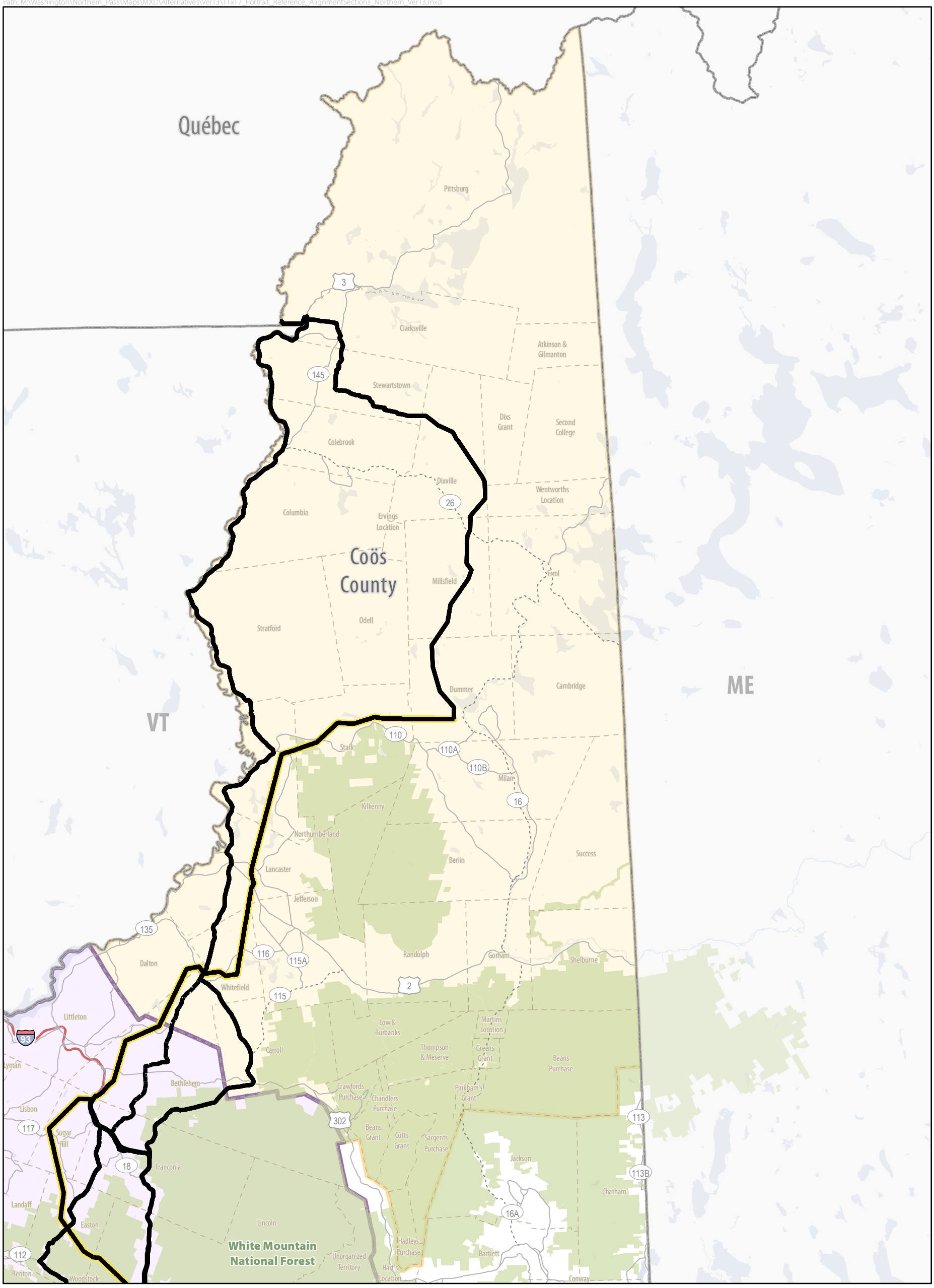

Legend

- State Boundary
- Political Boundary
- County Boundary
- Alternative Project Alignment
- Waterbody
- White Mountain National Forest

Section Boundaries

- Northern Section
- Central Section
- Southern Section
- Existing PSNH Transmission Route

SOURCE: ESRI 2011; Ecology and Environment 2014.

Map 2:
Northern Section
Northern Pass Transmission Line Project
Environmental Impact Statement

N

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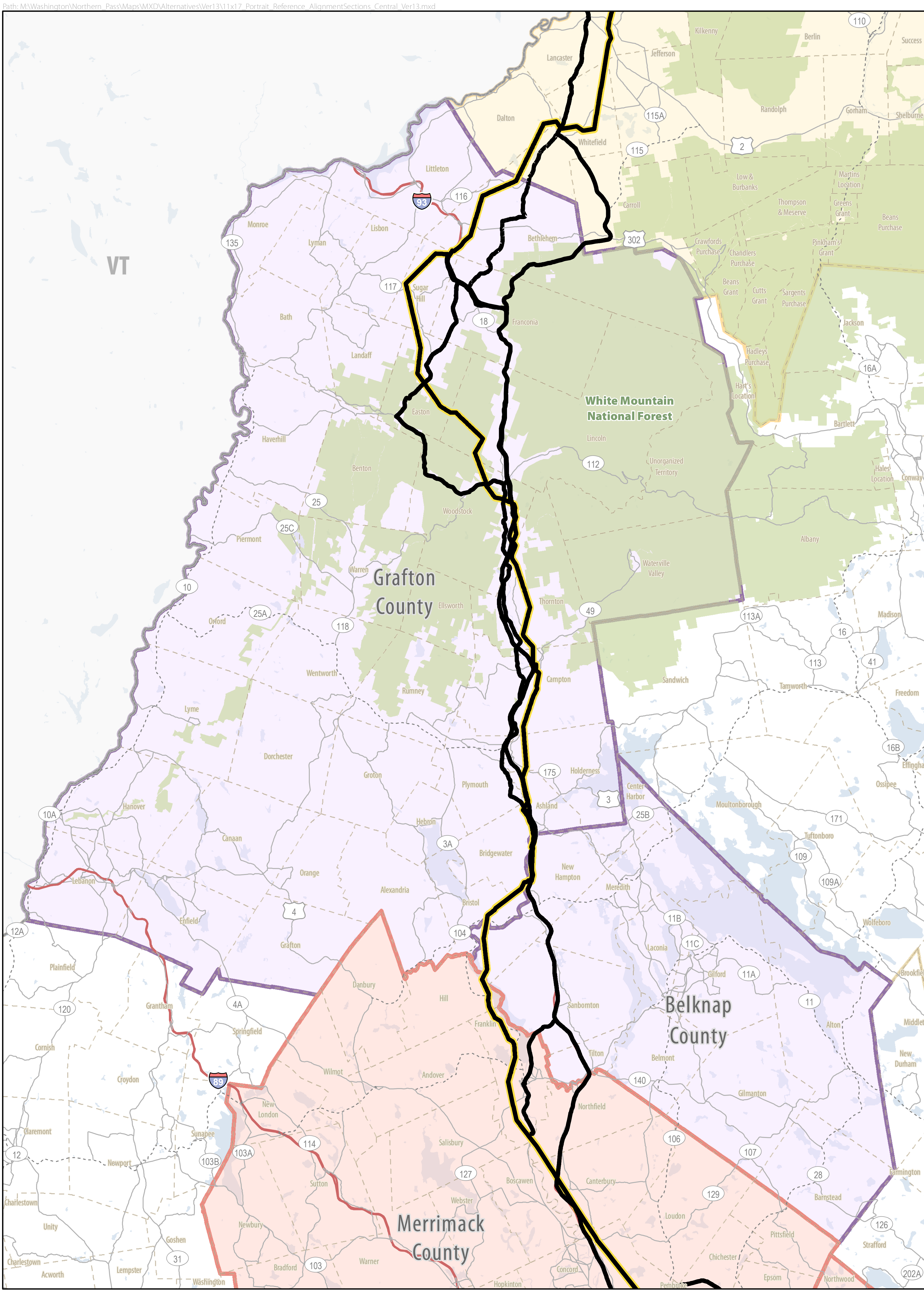

Legend

- State Boundary
- Political Boundary
- County Boundary
- Alternative Project Alignment
- Waterbody
- White Mountain National Forest

Section Boundaries

- Northern Section
- Central Section
- Southern Section
- Existing PSNH Transmission Route

SOURCE: ESRI 2011; Ecology and Environment 2014.

Map 3:
Central Section
Northern Pass Transmission Line Project
Environmental Impact Statement

N

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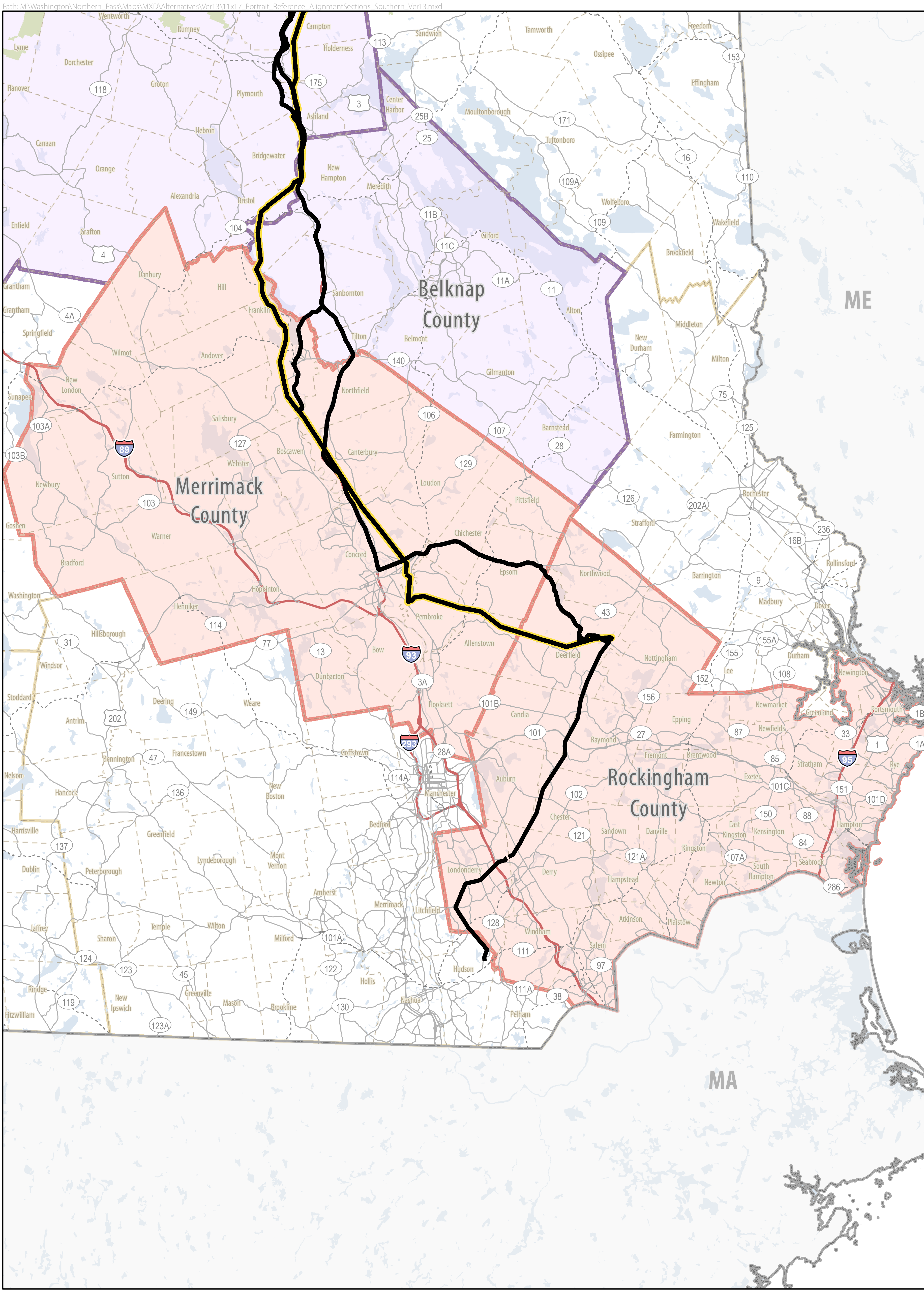

Legend

- State Boundary
- Political Boundary
- County Boundary
- Alternative Project Alignment
- Waterbody
- White Mountain National Forest

Section Boundaries

- Northern Section
- Central Section
- Southern Section
- Existing PSNH Transmission Route

SOURCE: ESRI 2011; Ecology and Environment 2014.

Map 4:

Southern Section

Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE

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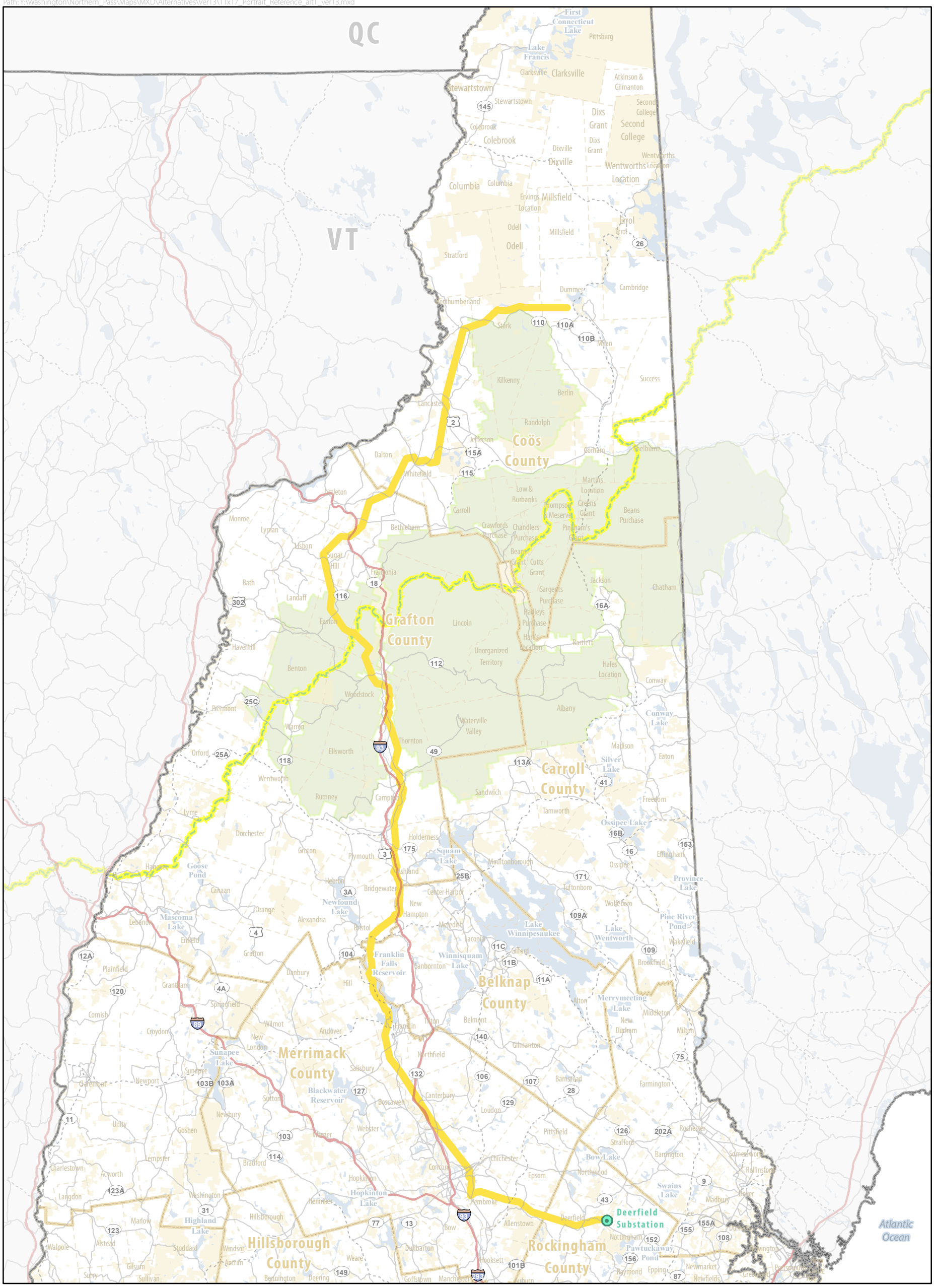

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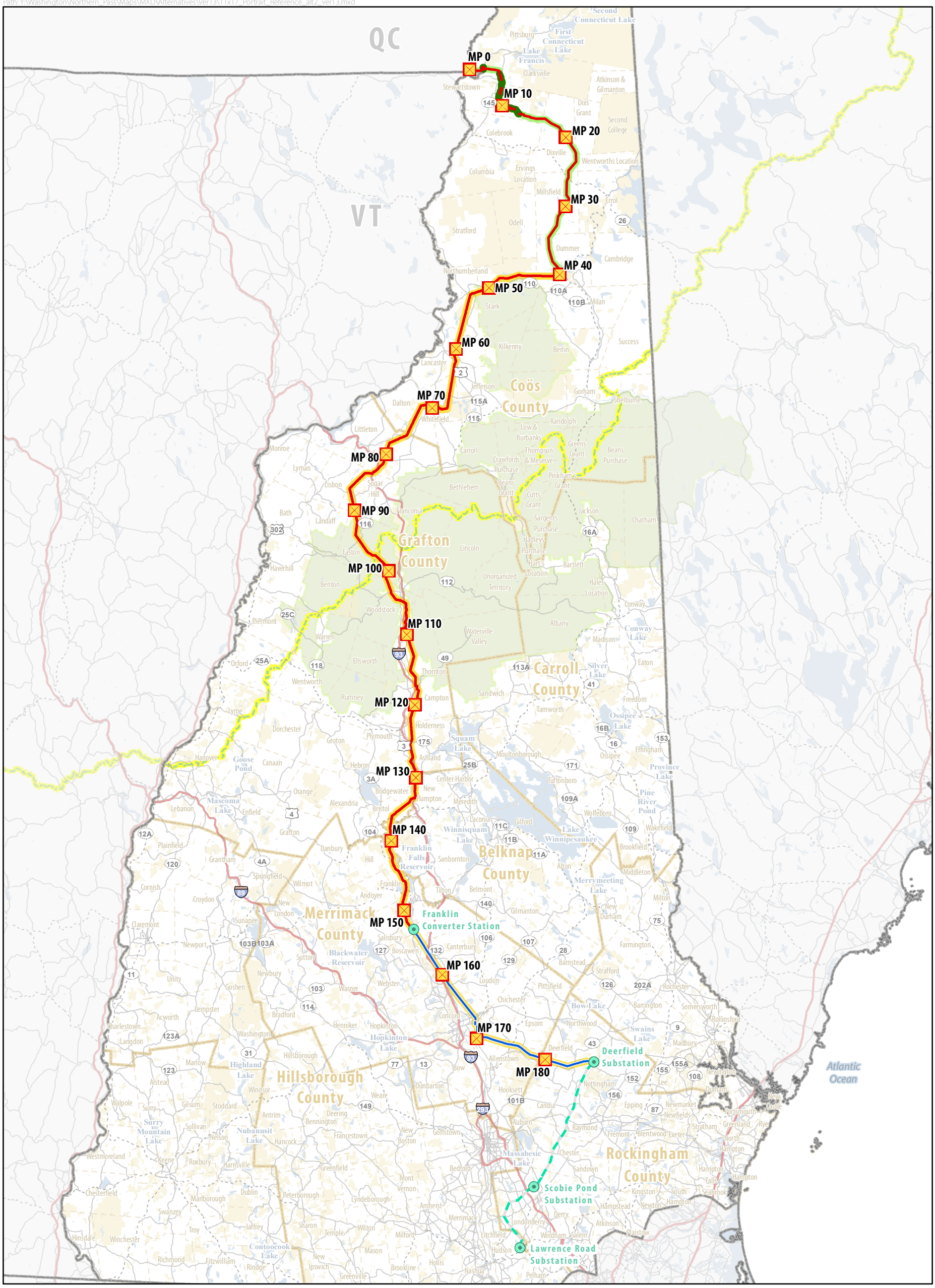

Legend

Existing Conditions

- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 2 Projects

- New Transmission Route
- Project in Roadway Corridor
- Overhead High-Voltage Direct Current Centerline
- Overhead High-Voltage Alternating Current Centerline
- Underground High-Voltage Direct Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 6:
Alternative 2 - Proposed Action
Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE
0 5 10 Miles

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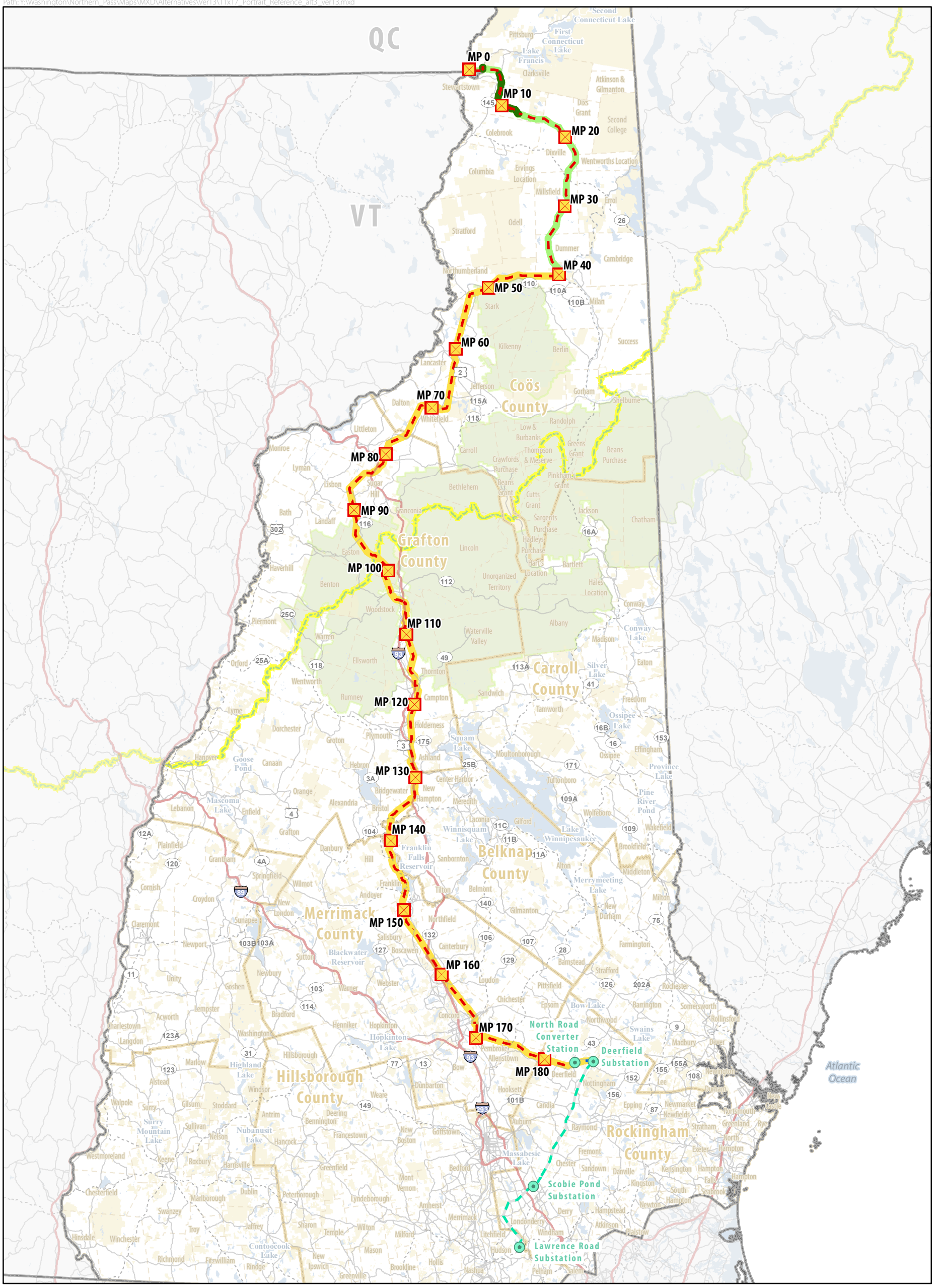

Legend

Existing Conditions

- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 3 Projects

- New Transmission Route
- Project in Roadway Corridor
- Underground High-Voltage Direct Current Centerline
- Underground High-Voltage Alternating Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 7:
Alternative 3 - Underground Transmission Cable in Proposed Action Alignment
Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE
0 5 10 Miles

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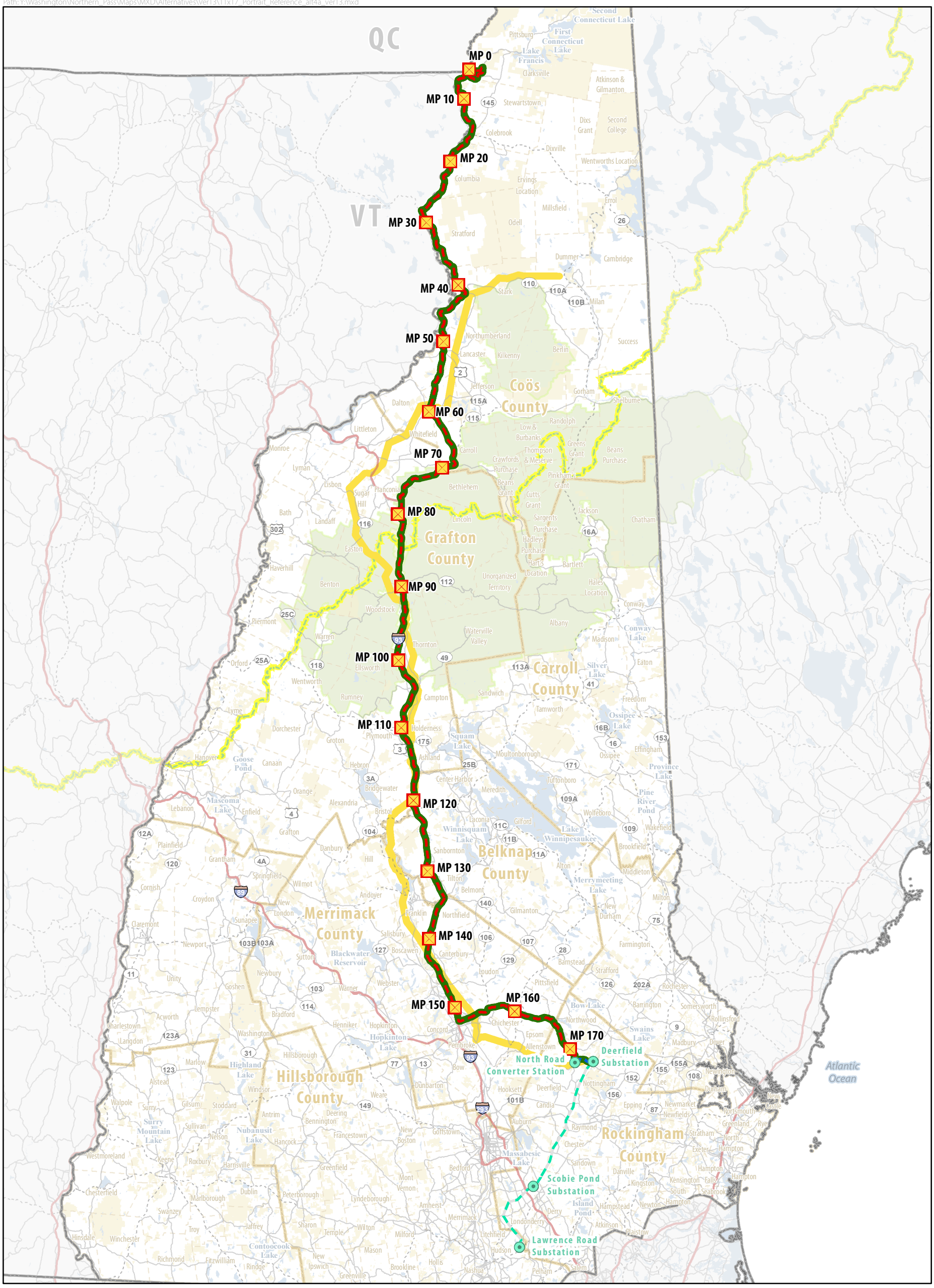

Legend

Existing Conditions
- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 4a Projects
- New Transmission Route
- Project in Roadway Corridor
- Underground High-Voltage Direct Current Centerline
- Underground High-Voltage Alternating Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 8:
Alternative 4a - Underground Transmission Cable in Roadway Corridors - *I-93 through Franconia Notch*
Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE
0 5 10 Miles

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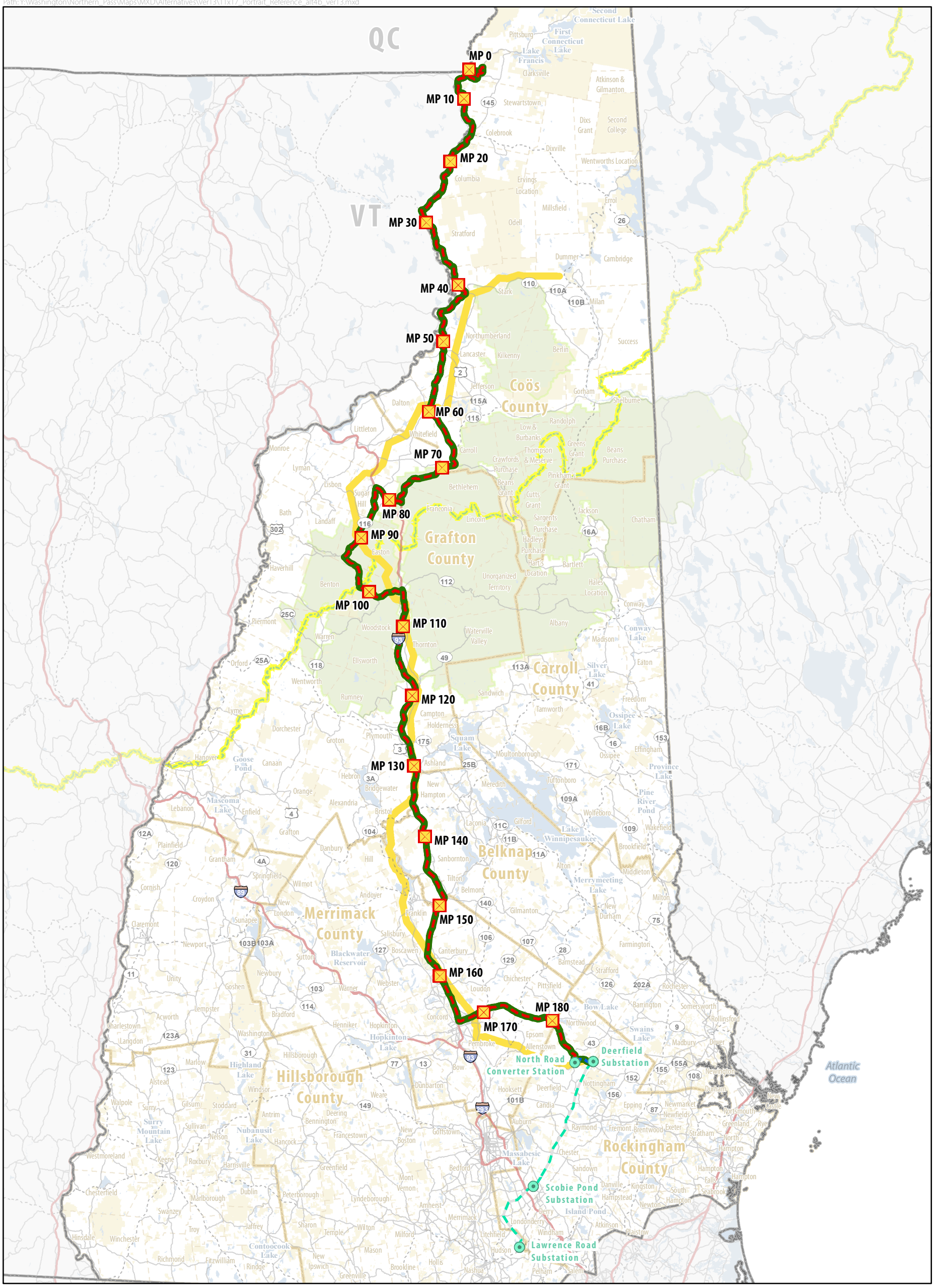

Legend

Existing Conditions
- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 4b Projects
- New Transmission Route
- Project in Roadway Corridor
- Underground High-Voltage Direct Current Centerline
- Underground High-Voltage Alternating Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 9:
Alternative 4b - Underground Transmission Cable in Roadway Corridors -
NH Routes 112 and 116 through WMNF
Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE
0 5 10 Miles

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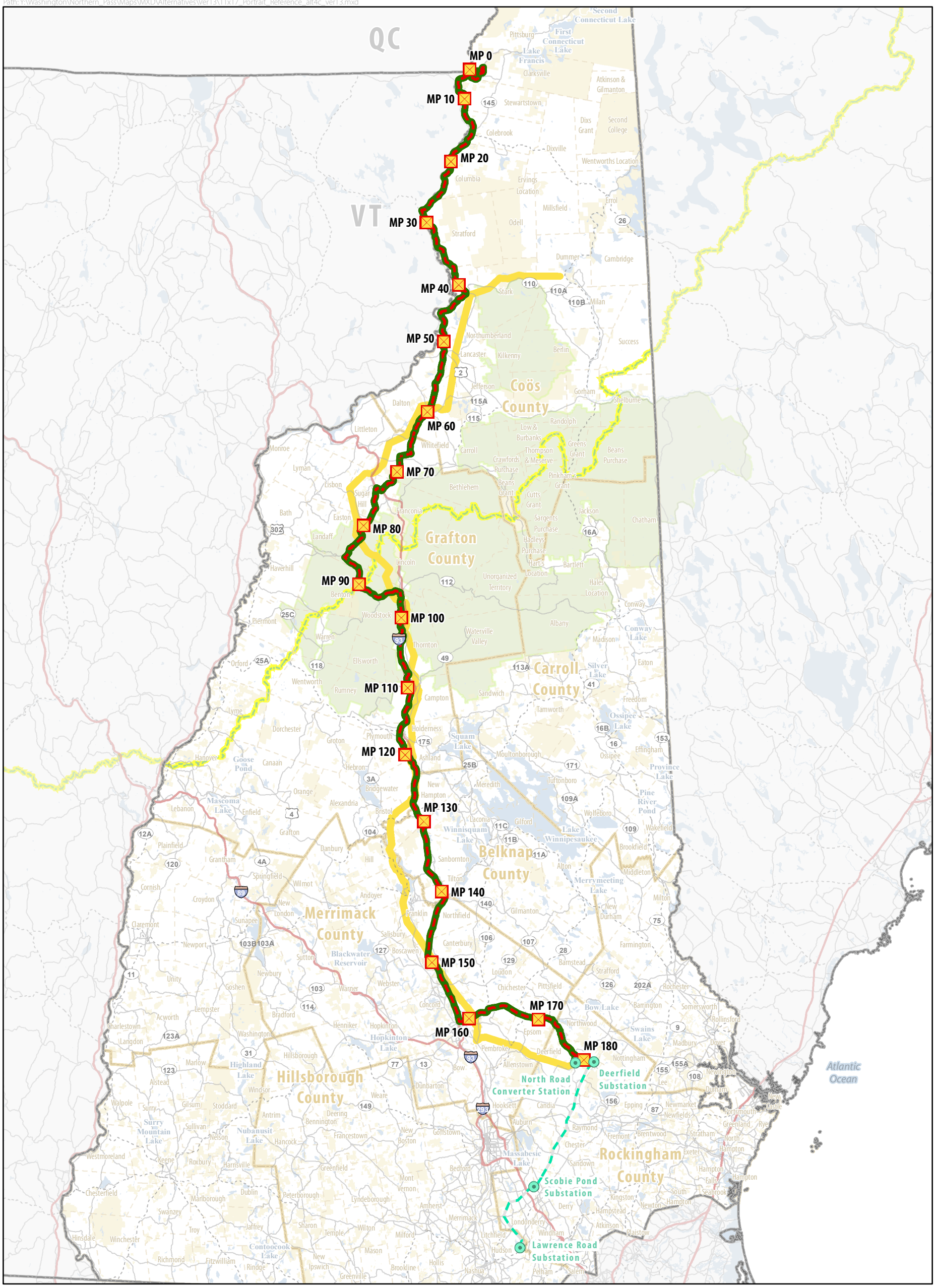

Legend

Existing Conditions

- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 4c Projects

- New Transmission Route
- Project in Roadway Corridor
- Underground High-Voltage Direct Current Centerline
- Underground High-Voltage Alternating Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 10:

Alternative 4c - Underground Transmission Cable in Roadway Corridors - *NH Routes 112 and 116 through WMNF and US Route 3 from North Woodstock to Ashland*

Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE

0 5 10 Miles

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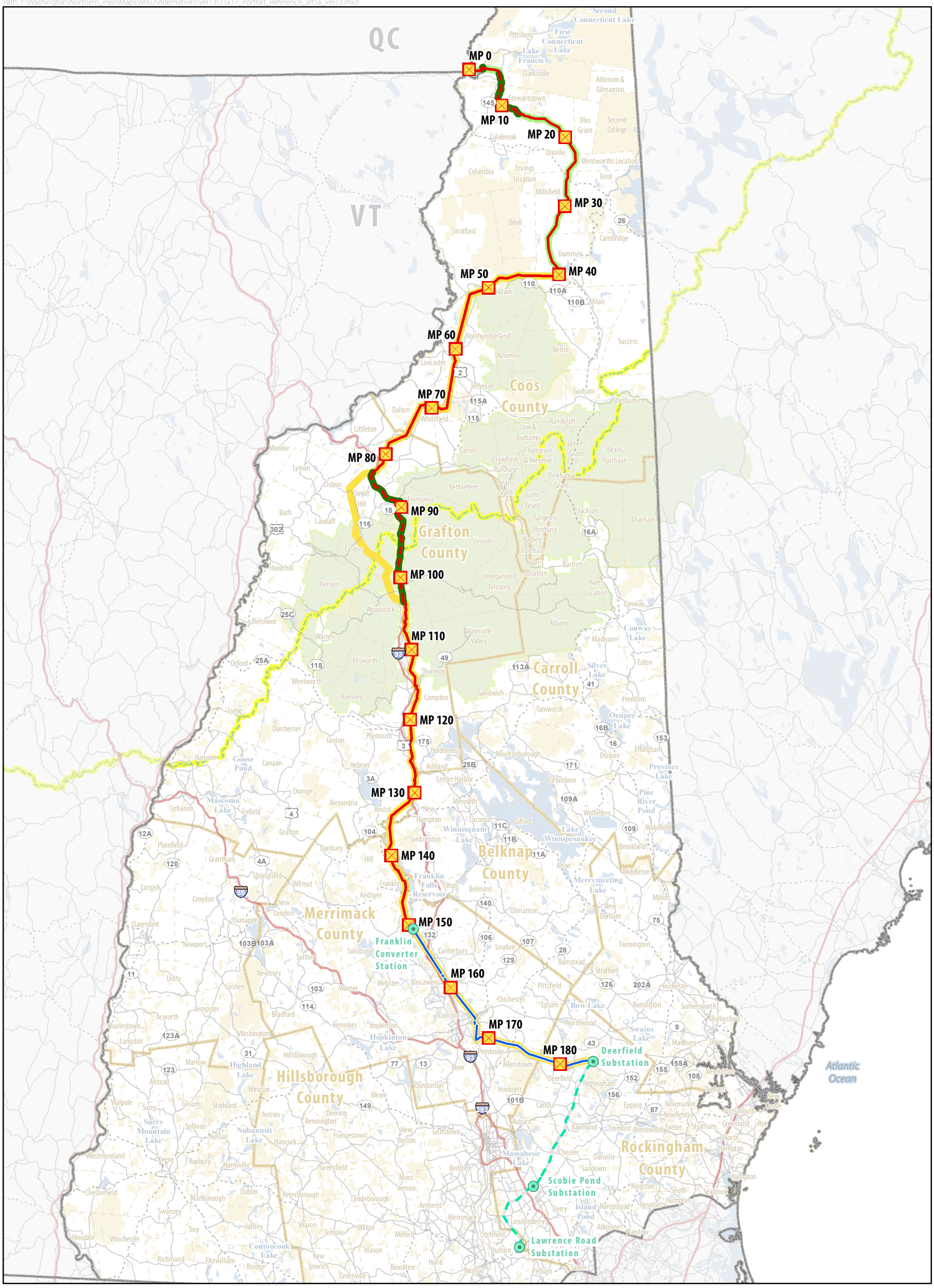

Legend

Existing Conditions

- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 5a Projects

- New Transmission Route
- Project in Roadway Corridor
- Overhead High-Voltage Direct Current Centerline
- Overhead High-Voltage Alternating Current Centerline
- Underground High-Voltage Direct Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 11:

Alternative 5a - Proposed Action except Underground Transmission Cable along *I-93 through Franconia Notch*

Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE

0 5 10 Miles

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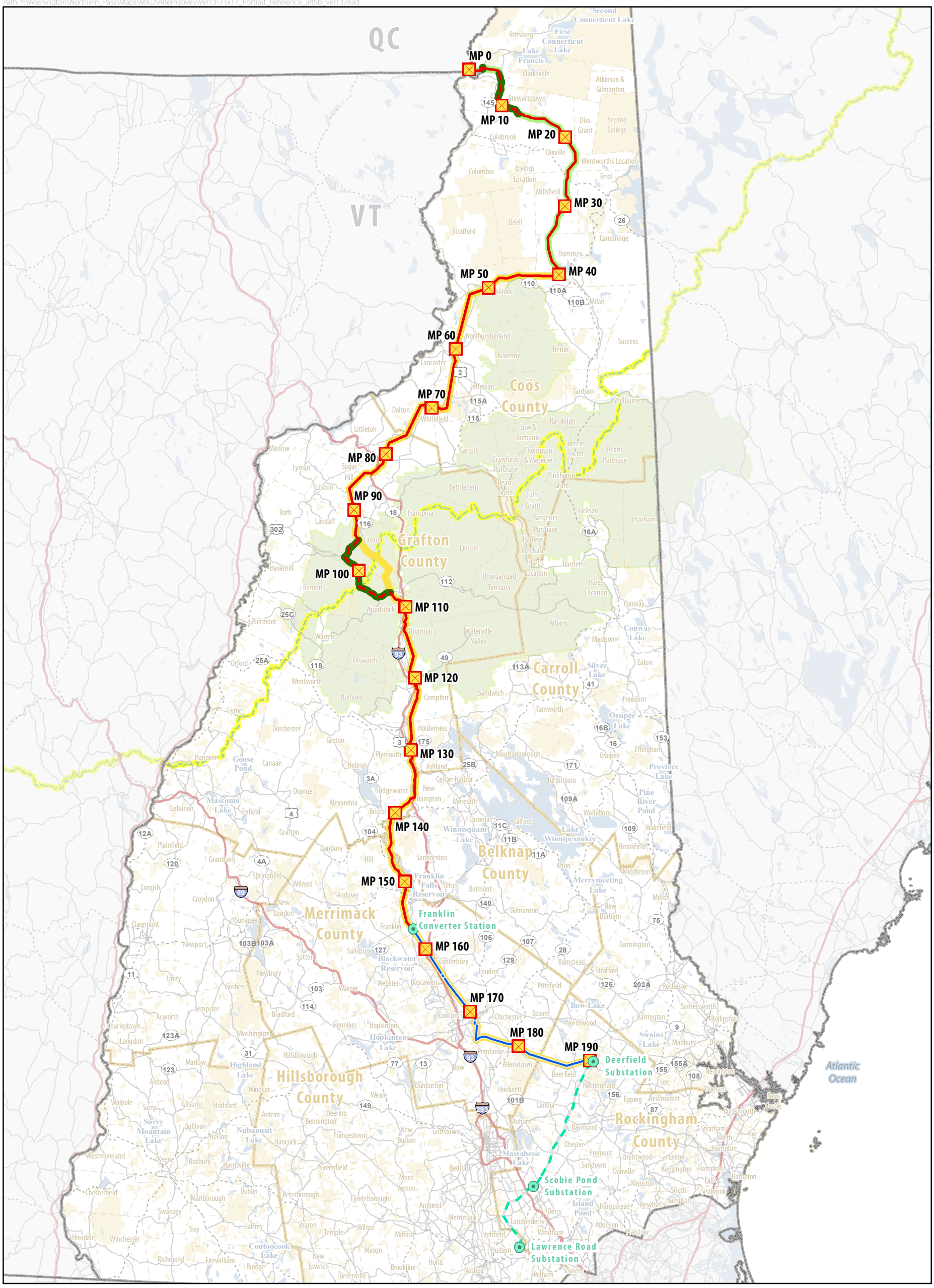

Legend

Existing Conditions

- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 5b Projects

- New Transmission Route
- Project in Roadway Corridor
- Overhead High-Voltage Direct Current Centerline
- Overhead High-Voltage Alternating Current Centerline
- Underground High-Voltage Direct Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 12:

Alternative 5b - Proposed Action except Underground Transmission Cable along *NH Routes 112 and 116 through WMNF*

Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE

0 5 10 Miles

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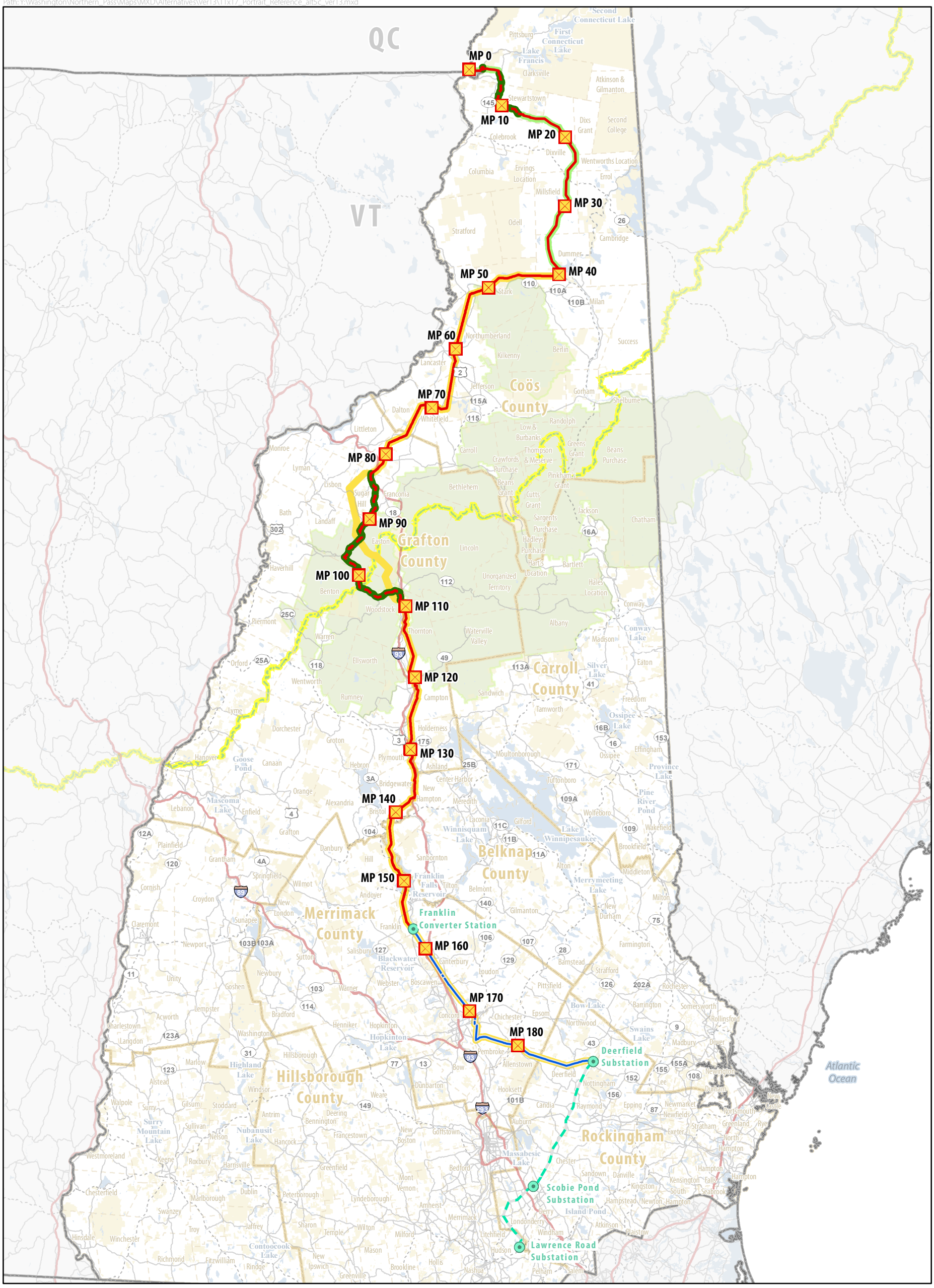

Legend

Existing Conditions

- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 5c Projects

- New Transmission Route
- Project in Roadway Corridor
- Overhead High-Voltage Direct Current Centerline
- Overhead High-Voltage Alternating Current Centerline
- Underground High-Voltage Direct Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 13:

Alternative 5c - Proposed Action except Underground Transmission Cable along *NH Routes 18, 112 and 116 through Sugar Hill, Franconia, Easton and WMNF*

Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE

0 5 10 Miles

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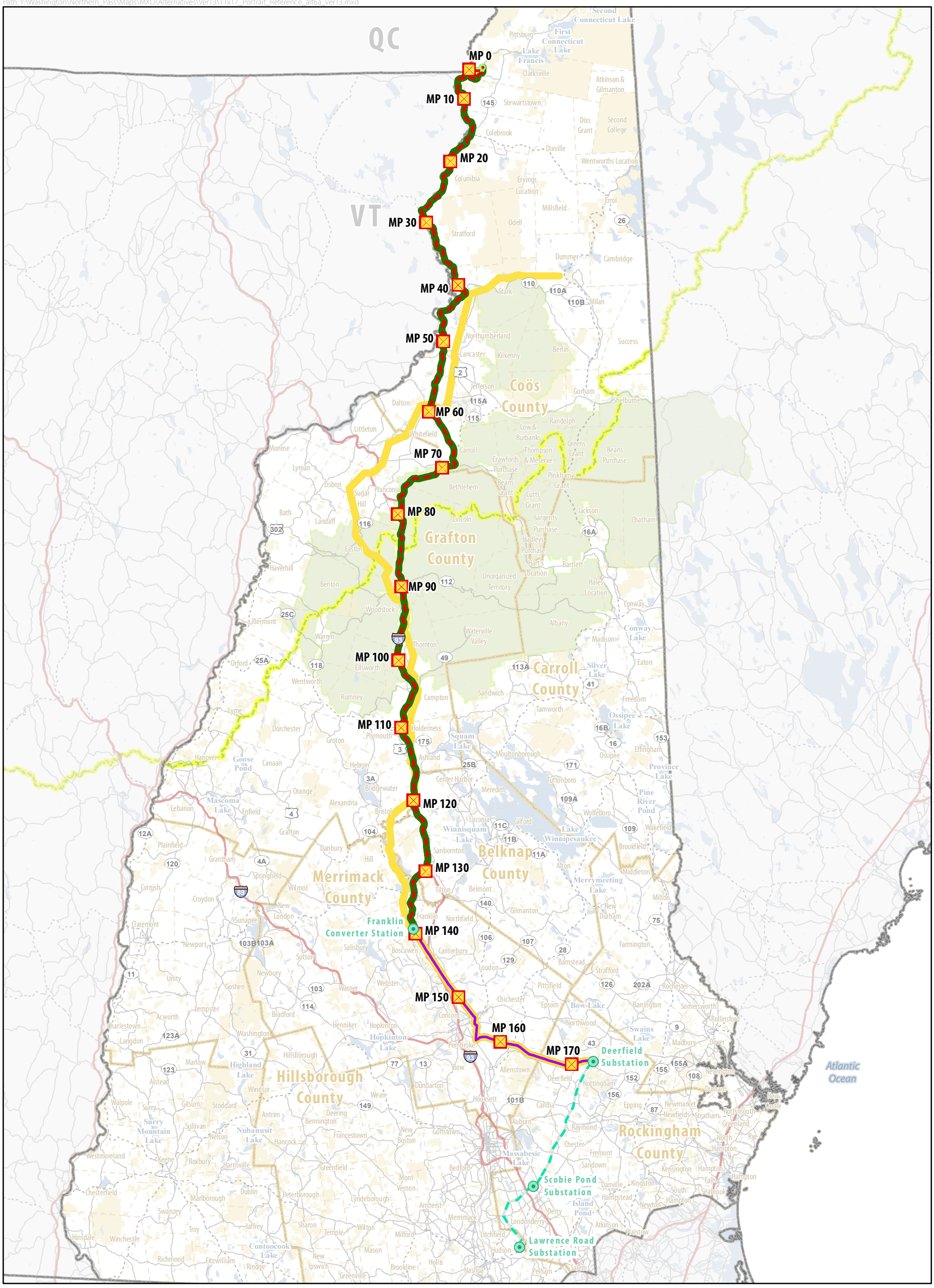


Legend

Existing Conditions
- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 6a Projects
- New Transmission Route
- Project in Roadway Corridor
- Overhead Co-located High-Voltage Alternating Current Centerline
- Underground High-Voltage Direct Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

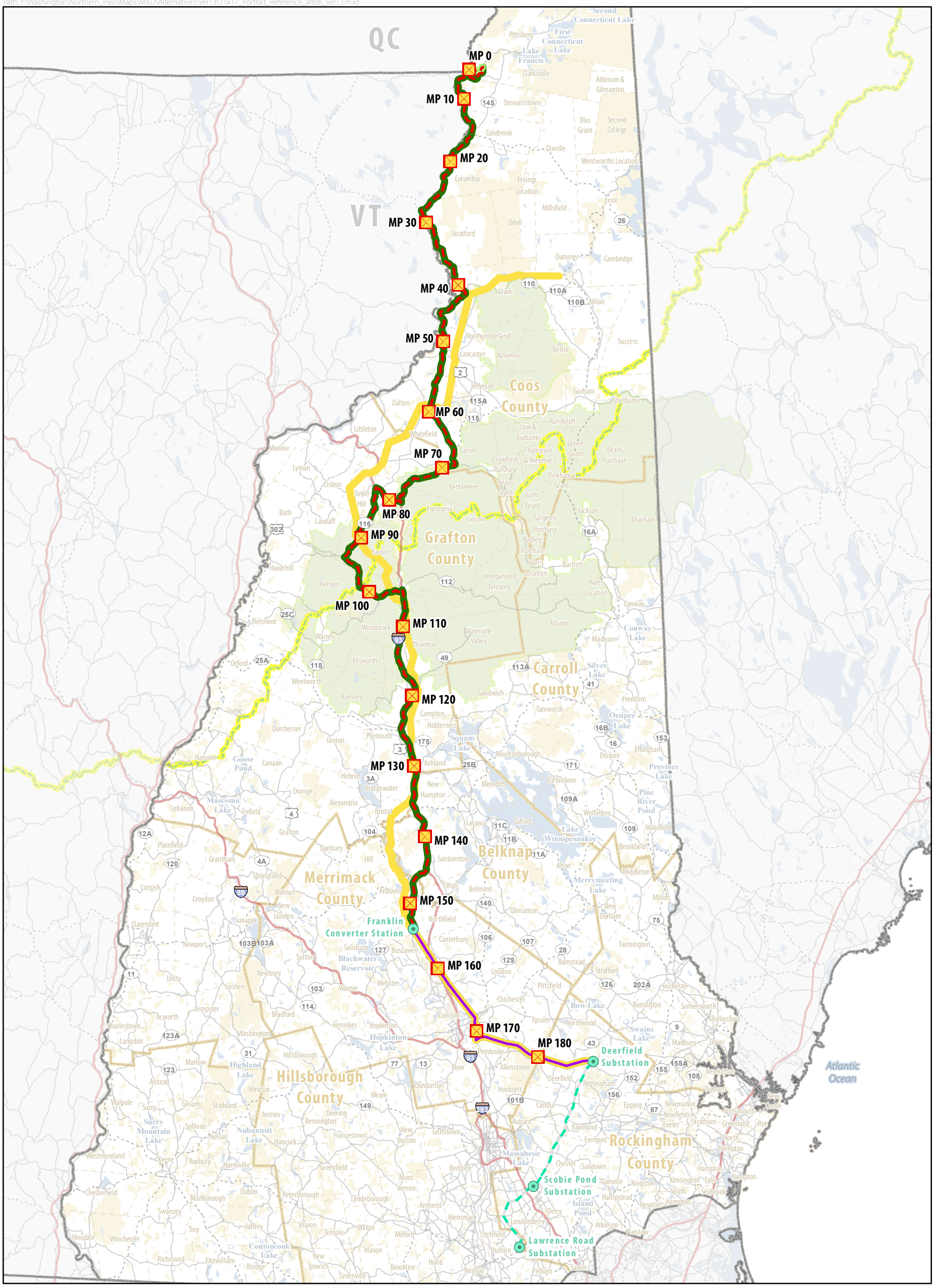
SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 14:
Alternative 6a - Underground Transmission Cable in Roadway Corridors *(I-93 through Franconia Notch)* and Co-located HVAC
Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE
0 5 10 Miles

Path: Y:\Washington\Northern_Pass\Maps\MXD\Alternatives\Ver13\11x17_Portrait_Reference_alt6b_ver13.mxd



Legend

Existing Conditions

- State Boundary
- County Boundary
- Political Boundary
- Freeway
- Major Road
- Secondary Road
- Appalachian National Scenic Trail
- Waterbody
- NH Conservation Land (WMA, State Forest, Conservation Areas, etc.)
- White Mountain National Forest
- Existing PSNH Transmission Route

Alternative 6b Projects

- New Transmission Route
- Project in Roadway Corridor
- Overhead Co-located High-Voltage Alternating Current Centerline
- Underground High-Voltage Direct Current Centerline
- Existing Transmission Line Upgrades
- Project Milepost
- Converter/Substation Location

SOURCE: ESRI 2011; GRANIT 2012; Burns and McDonnell 2013; USFS 2012; Ecology and Environment 2013

Map 15:

Alternative 6b - Underground Transmission Cable in Roadway Corridors

(NH Routes 112 and 116 through WMNF)

and Co-located Overhead HVAC

Northern Pass Transmission Line Project

Environmental Impact Statement

N

SCALE

0 5 10 Miles

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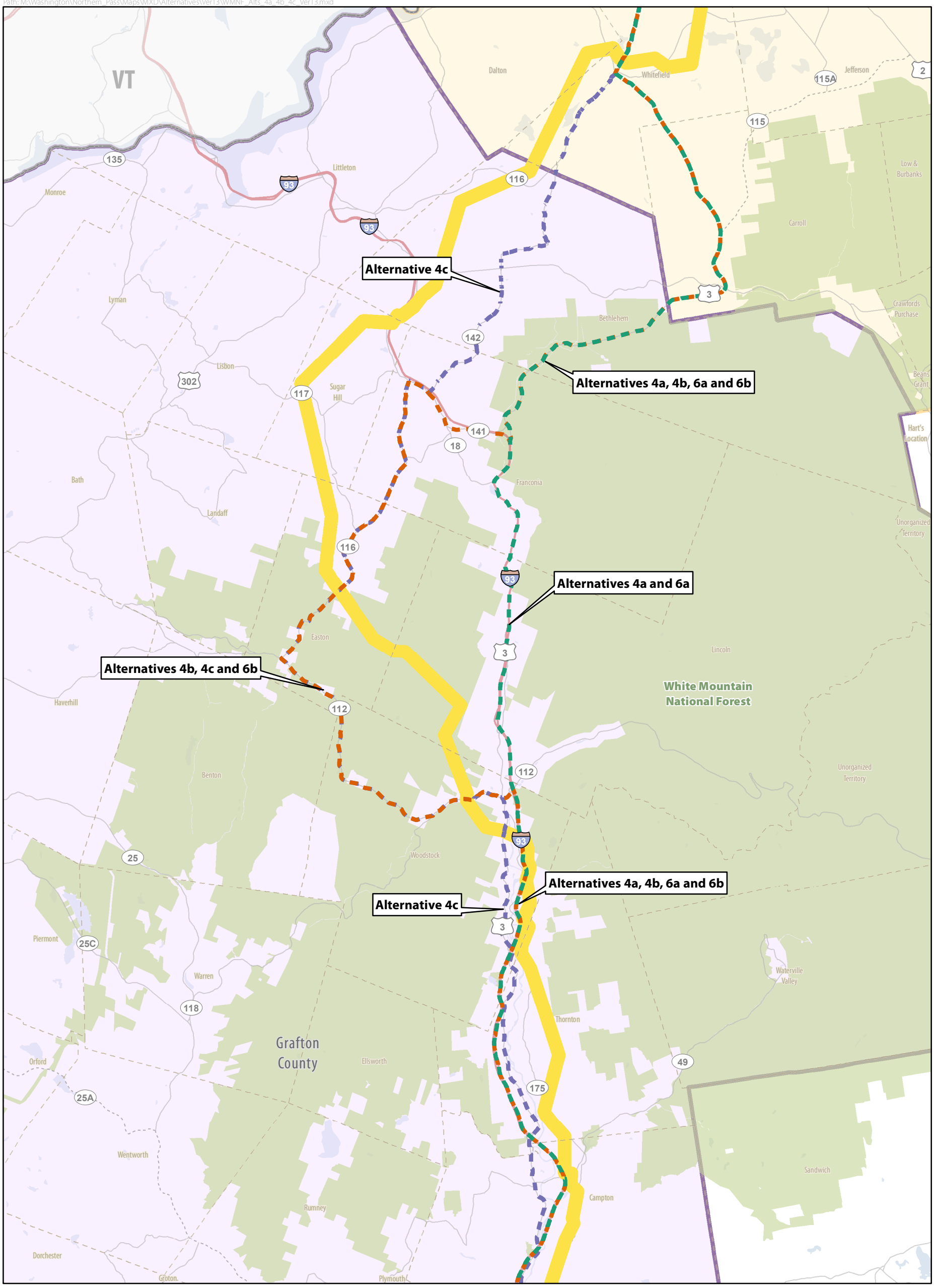

Legend

- State Boundary
- Political Boundary
- County Boundary
- Alternatives 4a and 6a
- Alternatives 4b and 6b
- Alternative 4c
- Waterbody
- White Mountain National Forest
- Existing PSNH Transmission Route

Section Boundaries

- Southern Section
- Central Section
- Northern Section

SOURCE: ESRI 2011; Ecology and Environment 2014.

Map 16:

Alternative 4 and 6 Variations in Vicinity of WMNF

Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE

0 1 2 Miles

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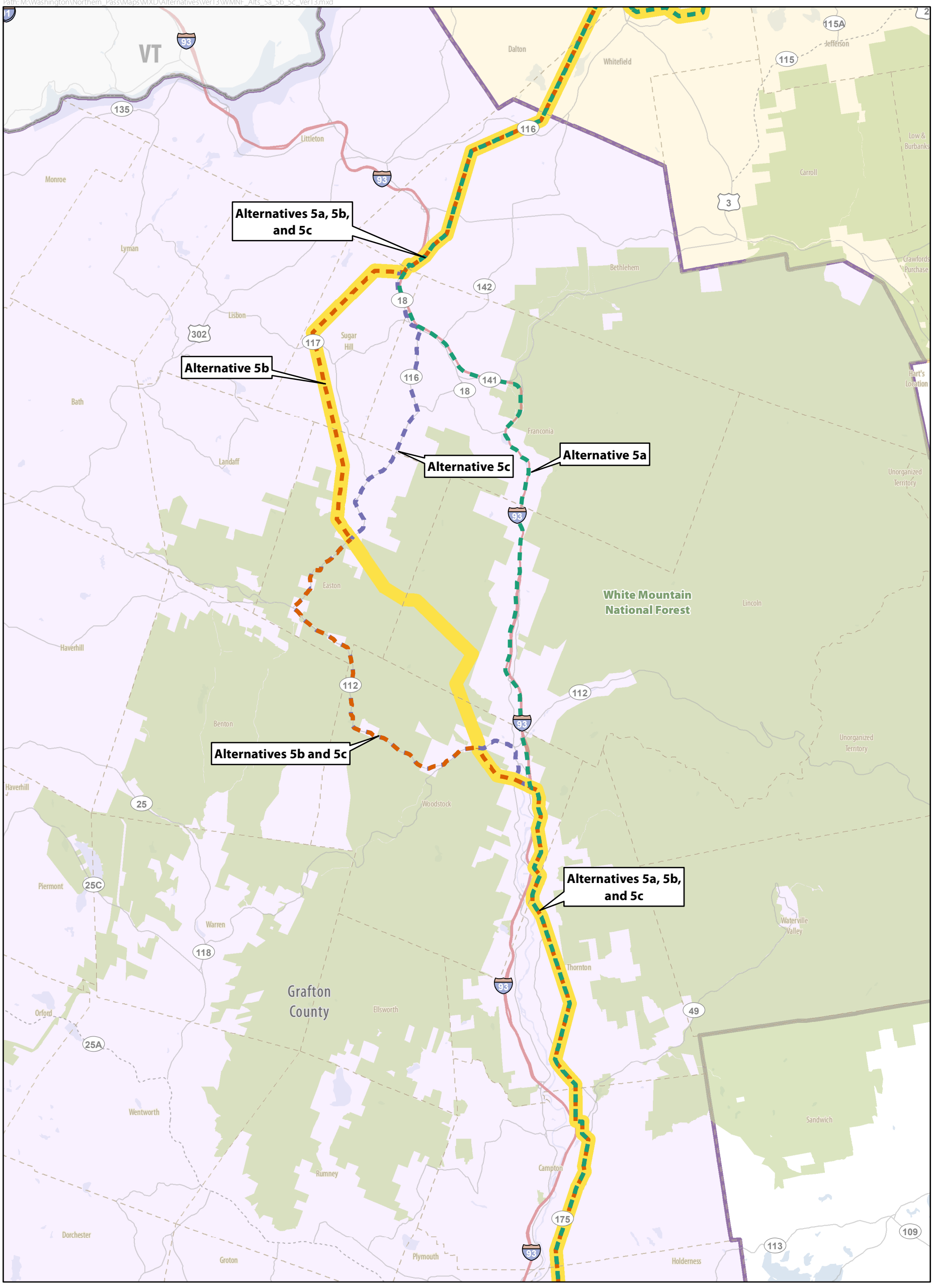

Legend

- State Boundary
- Political Boundary
- County Boundary

Alternative Project Alignment

- Alternative 5a
- Alternative 5b
- Alternative 5c

- Waterbody
- White Mountain National Forest
- Existing PSNH Transmission Route

Section Boundaries

- Southern Section
- Central Section
- Northern Section

SOURCE: ESRI 2011; Ecology and Environment 2014.

Map 17:

Alternative 5 Variations in Vicinity of WMNF

Northern Pass Transmission Line Project
Environmental Impact Statement

N

SCALE

0 1 2 Miles